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MILLING, BAKING, AND CHEMICAL EXPERIMENTS WITH HARD RED SPRING WHEAT
1953 CROP 2/

by

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2/ Cooperative investigations of the Field Crops Research Branch, Agricultural Research Service, and the Grain Division, Agricultural Marketing Service. The samples were obtained from the cooperative experiments with the State Agricultural Experiment Stations in the spring wheat region.

Plant Industry Station
Beltsville, Maryland
316 CC - August 1954

INTRODUCTION

Samples of the standard varieties and many of the new strains of hard red spring wheats, grown in cooperative experiments in the spring wheat region of the United States 3/, are milled each year by the United States Department of Agriculture and the flours baked into bread to determine their quality characteristics.

The baking methods and techniques used on the 1953 crop were essentially the same as those used in similar work for the 1944 to 1952 crops, inclusive, and described in previous reports.

The purpose of this report is to make available to cooperators the quality data on standard varieties, new strains. and commercial hard red spring wheat from the 1953 crop.

SOURCE OF SAMPLES

Tests were made on composite and individual samples of the uniform varieties and of many other varieties and strains grown in plot experiments at cooperating stations. These included samples grown at Madison, Wis.; Morris, Waseca, and Crookston, Minn.; Fargo, Langdon, Minot, and Dickinson, N. Dak.; Newell, S. Dak.; and Havre, Sidney, and Moccasin, Mont. Similar tests were made on Eastern and Western Composites of the 26 strains of wheat grown in the Uniform Regional Nurseries; on the wheats from the Supplementary Yield Nurseries; and on the wheats from the Station nurseries at Havre, Moccasin, and Sidney, Mont. Tests were also made on a number of sawfly resistant and foreign varieties and strains of wheat grown in Montana, and 22 of the better wheats from the Mexican breeding program grown in the United States.

There were also included 14 samples composited from samples of carlot receipts of wheat accumulated during a 90-day period of the 1953 crop movement by the Minneapolis, Duluth, and Great Falls offices of the Grain Branch, Agricultural Marketing Service. These samples represent country-run receipts of the class Hard Red Spring Wheat and included only those lots that were graded No. 3 or better under the official grain standards of the United States. These hereafter are referred to as commercial samples. This is the fifteenth season that such samples have been collected and tested.

3/ Ausemus, E. R. Results of spring wheat varieties grown in cooperative plot and nursery experiments in the spring wheat region in 1953. U. S. Dept. Agr., Field Crops Res. Br. 301 CC. 56 pp. March 1954. University Farm, St. Paul 1, Minn. [Processed]

METHODS USED IN MILLING AND BAKING TESTS

After the removal of dockage, the samples were prepared for milling by use of a milling separator and a scourer (both of experimental or laboratory size). The wheat samples were tempered in two stages. The water for the first temper was added 72 hours prior to milling and raised the moisture content of the grain to between 13.0 to 16.0 percent, depending upon the hardness of the variety, or within 1 percent of the total moisture required. The additional 1 percent of water for the second temper was added 1/2 hour before milling and raised the moisture content of the grain to between 14.0 and 17.0 percent. The wheat was milled on a Buhler automatic laboratory flour mill provided with three break and three reduction rolls. Ten percent of the low grade flour was discarded, leaving a 90 percent patent flour which was used for the chemical and bread baking tests. However, the flour yield data in the Tables are reported on the basis of a straight grade flour (100 percent) obtained from each sample.

The test weight per bushel of each sample was determined in the laboratory on the dockage-free wheat. The protein and ash contents are reported on a 14.0-percent-moisture basis and the flour yield on a moisture-free basis.

The hardness of the grain was determined by pearling 20 grams of dockage-free whole wheat for 1 minute in a model No. 38 Strong-Scott pearler. The amount of material pearled off, expressed as a percentage of the wheat, is called the pearling index. This pearling index has been found useful, not only as a guide in tempering the samples for milling, but also as a measure of the hardness of the grain. A low index figure indicates hard grain and a high index figure indicates soft grain.

The bread baking tests on the 1953 samples were made by a rich formula with none or varying amounts of potassium bromate added.

This method with the various ingredients used in 1953 is shown in Table 1.

Table 1. Baking method and ingredients used for samples of the 1953 crop.

Ingredients and treatment	Weight of ingredients, etc.
Flour (grams)	100.0
Yeast (grams)	2.0
Salt (grams)	1.5
Sugar (grams)	5.0
Potassium bromate <u>1</u> / (milligrams)	Optimum
Malted wheat flour (grams)	.25
Nonfat dry milk solids (grams)	4.0
Shortening (grams)	3.0
Water absorption (percent)	Optimum
Mixing time (minutes)	Optimum
Fermentation time (minutes)	180
Handling of dough	1st punch after 105 minutes 2nd punch after additional 50 minutes Mold after additional 25 minutes Proofing time - 55 minutes Baked 25 minutes at 450° F.

1/ Zero to 3 mgs. of potassium bromate used as necessary to obtain maximum loaf volume.

This baking procedure is based on the method of the American Association of Cereal Chemists with certain modifications deemed necessary for unbleached, experimentally milled flour.

A check or standard flour (12.8 percent protein and 0.49 percent ash on a 14.0-percent-moisture basis) was included in the baking trials with each day's tests. The average loaf volume of the baking tests made with the standard flour was 802 cc and the standard error was 20.2 cc. On this basis the least significant difference between two single bakes is 57 cc.

The undesirable properties of each variety with respect to loaf volume, crumb grain, and color characteristics of the bread is indicated in the Tables by "q" for questionable and "u" for unsatisfactory, adjacent to the numerical data pertaining to the property in question. No letter or other symbol with the numerical score is used to indicate a satisfactory rating. The following scores may be used as an index for judging the crumb grain and color and the quality of the bread:

59 or below	Very poor or unsatisfactory
60 to 69	Poor or questionable
70 to 79	Fair
80 to 89	Good
90 to 99	Very good
100 and above	Excellent

Bread loaf volume must also be adequate for the protein content of the flour if the variety is to be considered satisfactory. The loaf volumes are shown in the Tables on an "as is" protein basis and, in addition, they are shown adjusted to a 12.0 percent protein content.

An unsatisfactory rating on one or more of the properties indicates that the variety or strain is generally undesirable for hard wheat milling or bread making purposes except that a questionable rating on one or more of the quality properties may be balanced by other outstanding properties. The milling properties are discussed in the text and should be considered along with the bread baking properties.

EXPERIMENTAL RESULTS

The quality results for the plot and nursery composites, individual station samples, and others are given in Tables 2 to 8. The results for the commercial samples are shown in Table 9. Summaries of the new strains of current interest compared with Thatcher are shown in Table 10. These Tables largely are self-explanatory. The varieties or strains are arranged in the Tables in order of their maximum loaf volume. Acre yields are included, where comparable, to assist in the interpretation of results.

Station Plot Experiments

The quality data for the uniform varieties and others grown in plots are shown in Table 2.

Wisconsin - Two sets of samples from early and late sown plots, respectively, were received from Madison, Wisconsin. All were relatively high in wheat protein content, a number being higher than 16.0 percent. Many varieties of the early sown plots produced exceptionally high yields of flour, especially considering the test weight per bushel. Seven of them had flour yields of 76.0 percent or better.

Of the early sown varieties, Selkirk was one of the best. It produced a remarkably high yield of flour (77.0 percent) for the low test weight per bushel (56.7 pounds) and made very good bread. It is a strong bread wheat of very good dough properties and high water absorption.

Sample No. H195-45, W.242, was also among the best in milling and baking qualities considering the data as a whole. It appears to be much like the approved varieties in quality.

Strain H194-41, W.246, was satisfactory in milling and made good bread, but the dough mixing time was about 25.0 percent shorter than for Lee or Henry and about 40.0 percent shorter than the comparably grown Thatcher. In previous tests the dough mixing time has been satisfactory and similar (longer) to the generally grown varieties.

Strains H405c-7-1-1-1 and H405c-7-1-1-3 were very similar in quality. Both milled satisfactorily with a high yield of flour and made satisfactory bread. The loaf volumes of the bread were about that expected for the flour protein content of the samples. The dough handling properties of both were good, being elastic and pliable. These have dough mixing times similar to Mida, but were shorter than either Thatcher or Rushmore. The quality characteristics of others of this group were substantially the same as in previous years.

The strains Rushmore² x Surpresa; Frontana x Thatcher, Minn. 2854; and Willet, Minn. 2855, from the late sown plots made bread of good internal characteristics, but were deficient in loaf volume and in dough mixing time, being about 50 percent shorter than Lee. The dough was slightly sticky and weak. All of these samples milled poorly and two produced a low yield of flour. All exceeded Lee in wheat protein content.

Timstein x Henry, C.I. 13026, made bread that was good in water absorption, loaf volume, and crumb grain. It was inferior to Lee in crumb color, short in dough mixing time, and deficient in milling properties. The middlings were difficult to reduce to flour. The flour was granular to the feel and similar in this respect to the comparably grown Lee. The Wisconsin grown strain appears to be deficient in dough mixing time and milling properties.

Minnesota - Samples were received from three Minnesota stations, Crookston (early and late plantings), Morris, and Waseca. Protein contents of the wheat and flour were relatively low at Crookston and only medium at Morris and Waseca.

Selkirk, considering the data from all stations, milled satisfactorily and was one of the better wheats in flour yield. The dough characteristics were strong and the bread good in crumb color and grain. It required a medium amount of bromate for optimum bread results. Loaf volumes were about that expected in relation to the protein content of the samples.

Kentana made fair to good bread from a loaf volume and internal characteristics standpoint. but had a short dough mixing time. The dough was weak and sticky. Kentana required a high amount of bromate for optimum bread quality. It milled poor and the flour was very soft and bolted slow. This variety is considerably lower in a number of quality factors than the approved hard red spring varieties.

Frontana x Thatcher, Minn. 2854, and Willet, Minn. 2855, made bread of good loaf volume and crumb grain. but were deficient in dough mixing requirements. Both were much shorter in dough mixing time than many of the hard red spring varieties. The dough was sticky and slightly weak. Both milled well and the flour yield was about that expected in relation to test weight per bushel. The dough mixing time was shorter than that of the approved varieties and the dough handling properties were deficient.

Thatcher x Surpresa, Minn. 2824, appears to be similar to the approved varieties in milling performance and in loaf volume and crumb grain of bread. It had the highest loaf volume on a 12.0 percent protein basis in the averages of five varieties from the Minnesota stations. The crumb color was only medium good for this year's samples from the Minnesota stations and poorer

than last year's results. It had a shorter dough mixing time than most of the approved hard red spring varieties and the dough was sticky and slightly weak for the Morris and Crookston (early plot) samples. This is a questionable strain because of the short mixing time and poor dough handling properties.

The five Lee x Mida selections (grown only at Crookston) are promising from a quality point of view. All milled satisfactorily and produced a high yield of flour. No. 3880.132 was best in flour yield. All made bread generally good in quality. Strain No. 3880.83 considering the data as a whole made the best bread. Actually, the difference in quality is not very great between any of these Lee x Mida selections.

Timstein x Henry. II-44-65, C.I. 13026, (grown at Crookston only) milled satisfactorily, but produced a lower yield of flour than either Lee or Selkirk which had about the same test weight per bushel. It made good bread and the dough was elastic and strong. The dough mixing time was equal to the approved hard red spring varieties at this Station. It was about 25 percent shorter in dough mixing time than Thatcher for the last season's crop (1952) samples tested. This seems to be a fairly promising strain according to the few samples tested, providing the dough mixing requirements and flour yield are not too different from that of the accepted varieties.

South Dakota - South Dakota samples were received only from Newell. Triunfo x Thatcher, N.No. 630, milled satisfactorily, but the yield of flour was low in comparison to the test weight of the sample and to that obtained from other varieties of the same or lower test weight. It was one of the highest samples in protein content of wheat and had a low ash content in the flour. The loaf volume of the bread was slightly lower than expected in relation to the flour protein content, but the internal bread properties were very good. The dough mixing time was extremely short and less than half that of the approved varieties grown at the Newell, South Dakota, Station.

Rushmore² x Surpresa, PW36, milled satisfactorily, producing a fairly good yield of flour. The grain was softer than the approved varieties and the flour semisoft to the feel. It made good bread and the absorption was high, but the dough handling properties were inferior, the dough being soft, sticky, and weak. It also has a very short dough mixing time. It is not a promising wheat because of its short dough mixing time and other inferior characteristics.

Thatcher, Mida, Lee, Selkirk, and Rushmore made good bread. Lee, Selkirk, and Rushmore were among the best of these in flour yield.

North Dakota - Samples were received from four North Dakota stations: Minot, Dickinson, Langdon, and Fargo.

Lee x Mida sib, Ns. 3880, had good milling properties and produced a medium yield of flour. The ash content of the flour was low and the dough handling properties satisfactory. It made good bread. The water absorption and dough mixing time were similar to that of the approved hard red spring varieties. The crumb grain of the bread was exceptionally good. It was one of the better strains in this respect. It required more potassium bromate than either Thatcher

or Mida for optimum bread results. This is a promising bread wheat from the quality point of view.

Henry x Cadet, 2239, made fairly good bread and is a promising strain considering the data as a whole. The milling characteristics were satisfactory. The grain was found to be similar in hardness and produced a granular type flour like that milled from Thatcher. It made bread that was better in crumb grain than in crumb color. It was satisfactory in dough handling properties, but not considered as strong as Thatcher in this respect.

Thatcher x Surpresa. Minn. 2824, appears to be generally similar to the approved varieties in milling and baking performance. except for dough mixing time which was about 25 percent shorter than that of Lee, Thatcher, or Mida. Thatcher, Selkirk, Mida, and 1764 x Henry made good bread. Averages of the quality data from four North Dakota stations showed Selkirk to be highest of six varieties in yield of flour. It has been one of the best varieties in this respect at most stations.

Montana - Samples were received from three Montana stations: Moccasin, Havre, and Sidney. Strain 1764 x Henry, N.No. 2211, made good bread, but yielded less flour than Lee, Thatcher, or Mida. Quality results for N.No. 2211 grown at other stations in the hard red spring wheat region shows that it yields about 2 to 3 percent less flour than comparably grown samples of Thatcher. Many samples of N.No. 2211 have milled satisfactorily, but a number of others have shown a tendency of the middlings to be difficult to reduce to flour. It is a questionable strain because of its inferior milling properties.

The samples of Lee from Havre and Sidney and Mida from Havre made a loaf much lower in volume than expected considering the protein content of the samples. The past performance of these varieties from both Stations have been satisfactory. The wheat appeared to be sound, but the dough handling properties were poor and unsatisfactory. It is possible that the high temperatures (90° F. or higher) that prevailed some of the days during the fruiting period may account, in part, for the impaired loaf volumes.

Table 2. Yield, milling, baking, and chemical results for hard red spring wheats grown in replicated "plots" in 1953.

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Fealing Index	Optimum Baking Method										Leaf Volume Corrected to 12.0 Percent Protein				
					Protein					Absorp- tion	Min.	Mg.	Bromate Volume			Color	Crumb	Score	Cc.
					Wheat Flour		Flour		Ash				Volume	Grain					
					Pct.	Pct.	Pct.	Pct.											
Madison, Wisconsin																			
Ill-Hope, 1140507-1-1-3	311.5	53.1	32	16.8	15.1	76.0	.42	63	1.75	1	893	85	95	710					
Selkirk, CR 1166	313.7	56.7	30	15.4	14.5	77.0	.47	64	2.00	1	884	85	95	731					
Ill-Hope, 114557-1-1-1, W. 250	311.0	53.1	32	16.2	14.6	76.3	.46	62	1.75	1	879	80	95	722					
Thatcher x Surpresa, W. 2324	313.4	60.5	29	14.9	13.7	75.7	.44	61	1.25	1	877	75	95	768					
Thatcher x (Ill-Whs. 338 x Hope), 112434	313.6	53.5	30	15.0	13.9	76.0	.46	62	2.00	1	842	85	85	727					
1145-45, W. 242																			
Henry	112265	33.2	34	14.3	12.9	76.9	.45	61	2.00	1	835	80	90	777					
Lee	112438	32.4	29	15.1	13.9	76.7	.51	64	2.00	2	833	80	95	719					
Russmore	112273	29.3	30	14.8	13.9	73.5	.48	60	2.25	0	828	90	90	714					
Thatcher x (Ill-Whs. 338 x Hope), 112449	316.7	53.7	28	15.3	14.1	74.5	.44	62	1.50	0	812	90	90	691					
Ill-41, W. 246																			
Sturgeon	111703	29.0	39	15.3	13.9	72.7	.45	60	1.50	1	810	90	95	699					
Thatcher	110003	27.9	25	13.5	12.7	73.7	.50	62	2.50	1	800	75	95	756					
Wida	112008	27.1	28	13.8	12.5	76.0	.50	62	1.75	2	762	80	95	731					
Average	312.0	53.1	31	15.0	13.3	75.4	.47	62	1.85	1.0	838	83	93						
Madison, Wisconsin (Late sown)																			
Thomstein x Henry, 11444-655	113026	16.6	31	16.5	15.6	70.5	.67	63	1.25	2	881	75	95	676					
Willard, Wm. 2855	113099	20.4	32	17.3	16.1	66.2	.53	61	1.25	2	868	90	95	647q					
Thomstein x Thatcher, Wm. 2854	113030	21.8	32	16.9	15.8	68.8	.55	62	1.00	2	858	85	95	652q					
Lee	112438	14.0	24	15.3	14.5	71.4	.59	63	2.00	2	853	95	90	706					
Russmore ² x Surpresa, W. 336	112972	22.3	40	15.8	14.6	71.4	.60	60	1.00	2	782	85	85	643q					
Average	119.0	54.5	32	16.4	15.3	69.7	.59	62	1.30	2.0	848	86	92						

Table 2. Continued

Variety or Cross	C.I. No.	Acre Yield	Pearling Index	Optimum Baking Method										Co.			
				Pearling													
				Bu.	Lb.	Test Weight	Index Value	Protein		Flour		Absorption	Mixing Time		Bromate	Leaf Volume	
								Pot.	Pct.	Pot.	Pct.						Color
Crockston, Minnesota																	
Willet, M2855	13099	32.3	60.7	42	13.0	12.1	77.5	.41	60	1.25	1	748	85	90	742		
Thatcher x Surpresa, M2824	12641	45.1	64.0	32	11.7	10.3	77.5	.40	60	1.50	2	732	75	90	853		
Thatcher	10003	36.4	61.4	26	11.4	10.8	76.3	.46	63	2.00	1	713	80	85	792		
Selkirk, CT 186	13100	35.5	61.6	29	10.9	10.2	77.2	.44	61	2.25	1	695	85	85	818		
Frontana x Thatcher, M2854	13030	33.7	62.0	43	12.3	10.8	75.6	.39	60	1.00	1	692	85	85	769		
Kentana, M2860	35.7	62.5	50	11.3	10.0	72.1	.42	59	1.25	2	678	95	85	814			
Rushmore	12273	30.7	62.5	29	11.1	10.4	77.1	.45	61	2.00	0	671	75	80	774		
Rival	11708	33.6	59.2	30	10.2	9.7	77.7	.48	61	2.00	1	665	80	85	822		
Lee	12488	33.1	62.5	32	11.7	10.7	75.6	.42	61	2.00	0	657	85	75	737		
Henry	12265	38.5	60.6	38	10.7	9.7	78.5	.39	61	2.00	0	623	75	80	770		
Mida	12008	28.4	62.2	29	10.4	9.7	76.6	.44	60	2.00	0	620	80	75	767		
Average		34.8	61.7	35	11.3	10.4	76.5	.43	61	1.73	0.8	681	82	83			
Crockston, Minnesota (Late sown)																	
Willet, M2855	13099	36.2	61.1	41	13.1	12.4	76.4	.40	62	1.25	2	794	85	90	768		
Lee x Mida sel., 3880.132		39.5	62.5	27	11.8	10.9	77.4	.44	63	2.00	1	794	75	85	874		
Do. .83		40.8	61.8	28	12.4	11.5	76.8	.45	62	2.00	2	762	90	95	795		
Do. .124		41.1	62.5	29	11.9	11.3	76.5	.45	63	2.00	2	756	90	85	803		
Do. .105		36.5	61.2	28	12.4	11.7	76.3	.44	63	2.00	2	751	85	90	770		
Frontana x Thatcher, M2854	13030	35.1	61.6	38	12.7	11.8	76.6	.43	60	1.00	2	751	90	90	764		
Lee x Mida sel., 3880.127		40.6	62.2	29	12.2	11.2	75.5	.44	61	1.75	2	743	90	90	796		
Selkirk, CT 186	13100	39.4	60.0	29	11.8	11.3	78.1	.46	61	2.00	2	734	80	85	779		
Lee	12488	33.6	60.4	29	11.3	10.7	76.8	.44	63	2.50	2	717	85	85	804		
Timstein x Henry, IL-44-65	13026	37.5	60.7	30	11.5	10.4	74.5	.44	60	2.00	1	702	75	85	810		
Rushmore2 x Surpresa, FW36	12972	37.8	62.2	42	11.5	10.3	75.2	.42	59	1.00	2	698	70	90	813		
Mida	12008	22.5	57.3	22	9.3	8.7	74.0	.47	61	2.00	1	637	70	80	878		
Average		36.7	61.1	31	11.8	11.0	76.2	.44	62	1.79	1.8	737	82	88			

Table 2. Continued

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Pearling Index	Optimum Baking Method										Leaf Volume			
					Protein					Flour		Absorption	Mixing Time	Bromate	Leaf Volume	Crumb		Corrected to 12.0 Percent Protein
					Wheat Flour		Yield		Ash	Color	Grain					Score	Cc.	
					Pct.	Pct.	Pct.	Pct.										
Morris, Minnesota																		
Willet, M2855	13099	28.1	57.6	36	14.4	13.5	72.2	.43	61	1.00	1	868	80	80	771			
Lee	12488	24.7	56.1	27	13.8	12.9	73.9	.52	63	2.25	1	845	85	90	786			
Frontana x Thatcher, M2854	13030	31.3	58.1	39	14.1	13.0	74.1	.48	61	1.00	1	813	85	80	750			
Selkirk, CT 186	13100	34.0	56.7	30	13.3	12.7	74.0	.51	60	1.75	1	791	85	90	748			
Kentana, M2860		29.5	59.2	46	13.9	12.1	71.9	.44	61	1.25	1	773	90	75	766			
Rushmore	12273	21.8	56.4	26	12.3	11.7	74.3	.52	60	2.00	0	758	70	85	777			
Thatcher x Surpresa, M2824	12641	26.9	58.4	27	11.7	10.8	73.1	.47	60	1.50	0	734	70	95	746			
Average		28.0	57.5	33	13.4	12.4	73.3	.48	61	1.54	0.7	797	81	85				
Waseca, Minnesota																		
Lee	12488	24.2	52.6	27	14.7	13.9	71.4	.51	63	2.00	1	858	95	90	740			
Thatcher x Surpresa, M2824	12641	25.5	56.7	25	12.8	11.7	72.2	.42	60	1.50	1	810	70	85	831			
Selkirk, CT 186	13100	31.3	54.0	27	13.2	12.4	75.3	.49	64	2.25	1	794	85	85	768			
Rushmore	12273	20.4	53.8	24	12.8	12.3	73.6	.50	61	2.00	0	751	70	80	733			
Kentana, M2860		18.9	54.5	44	14.2	12.4	70.1	.48	60	1.25	2	745	100	85	721			
Average		24.1	54.3	29	13.5	12.5	72.5	.48	62	1.80	1.0	792	84	85				
Average Data for Five Varieties and Strains from Morris, Waseca, Crookston, Minnesota																		
Lee	12488	27.3	57.1	29	13.4	12.5	73.6	.48	62	2.08	0.7	787	88	85	754			
Selkirk	13100	33.6	57.4	29	12.5	11.8	75.5	.48	62	2.08	1.0	760	85	87	778			
Thatcher x Surpresa, M2824	12641	32.5	59.7	28	12.1	10.9	77.6	.43	60	1.50	1.0	759	72	90	810			
Kentana, M2860		28.0	58.7	47	13.1	11.5	71.3	.45	60	1.25	1.7	732	95	88	773			
Rushmore	12273	24.3	57.6	26	12.1	11.5	75.0	.49	61	2.00	0	727	72	82	761			

Variety or Cross	C.I. No.	Acre Yield	Bu.	Lb. Weight	Pearling Index	Protein		Flour		Absorp- tion	Mixing Time	Bromate	Optimum Baking Method		Loaf Volume Corrected to 12.0 Percent Protein
						Wheat Flour	Yield Ash	Loaf Volume	Crumb						
													Score	Co.	
Newell, South Dakota															
Selkirk, CT 186	13100	17.7	58.8	29	13.9	13.1	75.5	.51	63	1.50	2	804	80	90	736
1764 x Henry, 2211	12733	18.5	54.6	23	11.9	11.4	71.1	.48	64	2.00	2	782	75	80	823
Lee	12498	18.7	59.0	24	12.7	11.8	76.7	.55	66	2.25	2	762	85	95	775
Triunfo x Thatcher, 630	12625	20.3	61.5	33	14.5	12.9	71.9	.46	60	.75	0	760	95	90	707
Rushmore ² x Surpresa, PW 36	12972	20.6	61.0	36	13.5	11.9	73.4	.53	60	.75	2	722	80	85	728
Rushmore	12273	19.8	58.1	24	12.5	11.8	75.1	.54	59	2.00	0	718	80	85	730
Mida	12008	16.5	55.4	22	11.1	10.6	71.3	.54	60	2.00	1	681	80	80	771
Thatcher	10003	17.8	56.6	20	11.8	11.2	72.1	.47	61	2.00	0	668	80	85	716
Average		18.7	58.1	26	12.7	11.8	73.4	.51	62	1.66	1.1	737	82	86	
Minot, North Dakota															
Lee x Mida sib, Ns. 3880	12976	20.2	59.4	25	13.5	12.8	72.5	.41	61	2.00	2	807	85	95	756
Henry x Cadet, NN 2239	12779	22.3	56.1	28	13.3	12.7	70.8	.42	60	2.00	2	807	75	90	762
Lee	12488	13.5	55.6	26	13.7	13.1	72.0	.46	61	2.00	2	794	80	85	727
Selkirk, CT 186	13100	28.8	59.6	28	13.1	12.7	77.5	.43	60	2.00	1	785	85	85	742
Thatcher x Surpresa, M2824	12641	19.9	58.8	23	12.3	11.6	70.6	.41	60	1.00	2	779	70	85	806
Thatcher	10003	10.2	50.7	19	12.3	11.8	67.8	.45	61	2.00	1	771	60q	85	784
Rushmore	12273	12.3	53.9	24	12.7	12.3	72.3	.47	60	2.00	1	754	70	80	736
Mida	12008	8.8	52.3	23	11.8	11.1	69.2	.45	60	1.75	1	676	80	80	731
Average		17.0	55.8	25	12.8	12.3	71.6	.44	60	1.84	1.5	772	76	86	
Dickinson, North Dakota															
Selkirk, CT 186	13100	28.2	57.3	33	15.4	15.0	76.1	.41	61	2.25	2	954	90	85	763
Thatcher x Surpresa, M2824	12641	23.4	59.0	30	14.6	14.1	74.5	.38	59	1.75	1	888	85	90	756
Lee x Mida sib, Ns. 3880	12976	21.7	58.2	28	15.3	14.5	72.8	.41	62	2.00	2	864	95	95	715
Lee	12488	22.5	56.1	29	14.5	13.8	71.5	.40	60	2.25	2	804	80	90	599
1764 x Henry, NN 2211	12733	15.5	53.6	23	13.7	13.0	67.3	.38	60	2.00	1	791	75	90	730
Mida	12008	15.1	53.7	25	13.3	12.4	67.8	.39	59	2.25	1	785	75	90	760
Thatcher	10003	16.6	52.9	22	13.9	13.1	67.8	.41	60	2.25	0	776	75	85	711
Average		20.4	55.8	27	14.4	13.7	71.1	.40	60	2.11	1.3	837	82	89	

Table 2. Continued

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Pearling Index	Optimum Baking Method										Leaf Volume		
					Bu.	Lb.	Pot.	Protein		Flour		Absorp- tion	Mixing Time	Bromate	Leaf Volume	Crumb Color	Corrected to 12.0 Percent Protein
								Wheat Flour	Pct.	Yield	Pct.						
Langdon, North Dakota																	
Selkirk, CT 186	13100	36.0	60.6	31	14.1	13.5	77.0	.46	60	2.00	2	904	85	85	804		
Henry x Cadet, NN 2239	12779	32.0	57.4	25	13.2	12.6	71.4	.47	61	2.00	2	839	75	80	800		
Lee x Mida sib, Ns. 3880	12976	32.0	58.6	23	14.0	13.2	71.0	.46	61	2.00	2	804	85	90	731		
Thatcher x Surpresa, M2824	12641	34.0	58.9	21	12.3	11.7	72.3	.42	60	2.00	1	804	75	85	824		
Thatcher	10003	23.5	56.3	20	12.8	12.2	71.5	.48	61	2.25	1	740	75	85	728		
Lee	12488	32.0	57.8	23	13.3	12.7	71.8	.45	60	2.00	1	734	75	80	693		
Rushmore	12273	25.0	59.1	25	12.7	12.2	74.5	.46	59	2.00	0	716	75	80	704		
Rival	11708	22.8	52.8	17	11.4	11.0	69.6	.51	62	2.25	1	662	65q	75	722		
Mida	12008	21.0	53.7	19	11.4	10.7	70.0	.49	61	2.00	1	657	65q	70	737		
Average		28.7	57.2	23	12.8	12.2	72.1	.47	61	2.06	1.2	762	75	81			
Fargo, North Dakota																	
Lee	12488	25.6	60.5	25	12.1	11.1	73.3	.44	60	2.00	1	727	80	95	786		
Lee x Mida sib, Ns. 3880	12976	28.0	61.3	26	12.9	11.5	72.6	.44	60	2.00	1	708	70	80	739		
Selkirk, CT 186	13100	26.1	58.6	26	12.2	11.3	74.2	.47	59	2.25	1	705	80	90	749		
Rushmore	12273	23.3	59.3	24	11.3	10.6	74.3	.47	59	2.00	1	698	75	85	790		
Thatcher x Surpresa, M2824	12641	27.2	62.5	24	10.9	10.1	73.2	.44	59	1.50	1	691	75	85	821		
Henry x Cadet, Ns. 2239	12779	22.2	57.0	24	11.2	10.4	71.8	.45	59	2.00	1	678	75	85	782		
Mida	12008	17.4	58.4	21	10.5	9.8	72.3	.45	59	2.00	1	670	80	85	820		
Thatcher	10003	21.5	57.1	20	10.9	10.2	71.7	.49	59	2.50	0	659	65q	90	775		
Average		23.9	59.3	24	11.5	10.6	72.9	.46	59	2.03	0.9	692	75	87			
Average Data for Six Varieties and Strains from Four North Dakota Stations																	
Selkirk, CT 186	13100	28.9	59.0	29	13.7	13.1	76.2	.44	60	2.12	1.5	837	85	86	784		
Lee x Mida sib, Ns. 3880	12976	25.5	59.4	26	13.9	13.0	72.2	.43	61	2.00	1.7	794	84	90	735		
Thatcher x Surpresa, M2824	12641	24.4	59.8	25	12.5	11.9	72.7	.42	60	1.56	1.2	790	76	86	802		
Lee	12488	23.4	57.4	28	13.4	12.7	72.1	.44	60	2.06	1.5	765	79	88	726		
Thatcher	10003	18.0	54.2	20	12.5	11.8	69.7	.46	60	2.25	0.5	736	69	86	749		
Mida	12008	15.6	54.5	22	11.7	11.0	69.8	.45	60	2.00	1.0	697	75	81	762		

Table 2. Continued

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Pearling Index	Optimum Baking Method										Loaf Volume		
					Bu.	Lb.	Pet.	Pet.	Protein	Flour Yield	Ash	Absorption	Mixing Time	Bromate	Loaf Volume	Crumb	
																Color	Grain
Moccasin, Montana																	
Thatcher	10003	19.5	59.5	31	16.1	15.2	73.0	.40	61	2.00	1	903	65q	90	713		
1764 x Henry, NN 2211	12733	23.1	59.1	29	16.6	15.7	70.7	.40	63	2.50	2	866	85	90	662q		
Selkirk, CT 186	13100	30.1	58.4	31	15.3	14.4	75.2	.40	59	2.00	1	817	95	95	681q		
Lee	12488	21.6	60.1	34	16.1	14.8	73.1	.43	64	2.50	0	810	95	95	657q		
Mida	12008	21.7	62.0	31	16.0	14.7	74.1	.44	59	2.00	1	795	95	90	649q		
Average		23.2	60.0	31	16.0	15.0	73.2	.41	61	2.20	1.0	838	87	92			
Havre, Montana																	
1764 x Henry, NN 2211	12733	17.3	61.2	27	16.2	15.1	72.8	.46	67	2.25	1	910	75	90	723		
Selkirk, CT 186	13100	18.4	61.1	30	14.4	14.1	75.7	.47	65	2.00	1	903	85	85	768		
Thatcher	10003	20.8	61.6	29	15.3	14.6	76.0	.50	65	2.00	1	892	55u	90	733		
Mida	12008	19.1	63.6	31	17.9	17.1	74.6	.45	66	1.50	0	884	80	95	620u		
Lee	12488	20.5	61.3	32	17.5	15.9	73.0	.54	65	1.25	1	768	70	50u	580u		
Average		19.2	62.0	30	16.3	15.4	74.4	.48	66	1.80	0.8	871	73	82			
Sidney, Montana																	
Thatcher	10003	30.7	58.7	28	12.7	11.9	74.4	.47	63	2.25	1	769	80	90	775		
Lee	12488	31.4	59.6	34	15.1	14.5	75.4	.46	64	2.00	1	766	75	90	634u		
1764 x Henry, NN 2211	12733	28.3	59.0	30	12.6	11.9	73.6	.41	64	1.50	1	746	85	90	752		
Selkirk, CT 186	13100	36.1	59.1	32	12.6	11.9	76.4	.46	64	2.00	1	735	85	85	741		
Mida	12008	25.2	60.0	29	11.5	10.7	74.1	.47	64	1.75	1	684	80	85	767		
Average		30.3	59.3	31	12.9	12.2	74.8	.45	64	1.90	1.0	740	81	88			

Table 2. Continued

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Pearling Index	Pearling					Optimum Baking Method					Leaf Volume	
					Bu.	Lb.	Pot.	Pct.	Pct.	Flour Yield	Ash	Absorption	Mixing Time	Bromate Volume	Leaf Volume	Corrected to 12.0 Percent Protein
Average Data for Five Varieties and Strains from Three Montana Stations																
Thatcher	10003	23.7	59.7	29				14.7	13.9	74.5	.46	63	2.08	1.0	855	90
1764 x Henry, NN 2211	12733	22.9	59.8	29				15.1	14.2	72.4	.42	65	2.08	1.3	841	90
Selkirk, CT 186	13100	28.2	59.5	31				14.1	13.5	75.8	.44	63	2.00	1.0	818	88
Mida	12008	22.0	61.9	30				15.1	14.2	74.3	.45	63	1.75	0.7	788	90
Lee	12488	24.5	60.3	33				16.2	15.1	73.8	.48	64	1.92	0.7	781	78

Uniform Regional Nursery Composite

Twenty-six wheats from the Uniform Regional Nursery have been tested for their milling, baking, and chemical properties. A composite of the grain was made from 10 stations as shown in a footnote to Table 3 along with the quality results.

A number of the samples milled unsatisfactorily. The bran was generally tough and hard to clean free from the flour and/or the middlings reduced slowly as mentioned later. In some samples the flour was difficult to bolt or sieve.

The best strains for bread, considering the data as a whole, were Selkirk; Henry x Thatcher-W.38-Ill. 1-Hope, Wis. 250; and Timstein x Henry, II-44-65. All three milled satisfactorily and two of them produced an exceptionally high yield of flour. The dough handling properties were good and the mixing time was like that of the approved hard red spring wheats. The bread was high in loaf volume and had good internal characteristics. Thatcher and Marquis made acceptable bread, but were not satisfactory in milling. Both were low in test weight; no doubt, an attributing factor to their questionable milling performance.

Two selections from Henry x Cadet were included in this study. Of these, N.No. 2239, considering the data as a whole, was the best. It is perhaps not as strong as Thatcher. but has made good bread. Henry x Cadet, N.No. 2300, made satisfactory bread, but milled poorly.

The Rushmore² x Surpresa strains as a group generally had good milling properties and made bread satisfactory in volume, crumb color, and grain. but had short dough mixing times. Most of these strains required large amounts of bromate for optimum bread. The pearling index indicates that the Rushmore² x Surpresa strains generally were similar to Marquis and Thatcher with respect to hardness of the grain.

The doughs from many of these strains were sticky and weak and very poor. Strain PW36 had the shortest dough mixing time which was considerably less than for either Marquis or Thatcher. Short dough mixing times generally are associated with a short mixing tolerance.

The Rushmore² x Surpresa strains. considering the data as a whole with the exception of dough mixing time making the best bread, were Ns. Nos. 4046, 4043, and PW114. Strain N. No. 4048 milled satisfactorily and made a loaf of very good characteristics, but was deficient in dough handling properties.

Strain Mida x Kenya 117A made good bread, but was deficient in flour yield and milling quality.

The Frontana x Thatcher strains as a group had short dough mixing times and required only small amounts of bromate for optimum bread. The loaf volumes were fairly high except for II-46-52 which was questionable. The internal bread characteristics were medium to good. Strain II-46-52 was the best of these in dough handling properties.

Kenya-Gular-Pilot x Kenya 58-Newthatch is not promising from a quality point of view. It was deficient in loaf volume, flour yield, milling quality, and dough handling properties.

Red Egyptian x Frontana made reasonably good bread and appears from this single test to be satisfactory in quality. The dough mixing time might not be as long as that of the approved varieties, but in consideration of its other quality properties might be acceptable. It was one of the highest in absorption (66.0 percent) among the 26 Uniform Regional Nursery samples.

Table 3. Yield, milling, baking, and chemical results on 26 wheats grown in the Uniform Regional Nursery, 1953 crop 1/

Variety or Cross	C.I. No.	Acre Yield	Test Weight	Pearling Index	Protein		Flour		Absorp- tion	Mixing Time	Optimum Baking Method			Leaf Volume	
					Wheat Flour	Pct.	Yield	Ash			Bromate	Loaf Volume	Crumb		Corrected to 12.0 Percent Protein
													Pct.	Score	
Bu.	Lb.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Mg.	Co.	Score	Score	Co.		
Frontana x Thatcher, II-46-13	13030	31.7	59.1	33	15.6	14.9	71.9	.44	62	.75	2	942	90	95	759
K58 x Mida-Newthatch, II-44-45	13045	24.1	57.4	31	14.1	13.0	68.8	.49	61	1.25	2	942	80	80	870
Henry x Thatcher-138-111. 1- Hope, N.250	13098	24.6	57.9	26	14.9	13.6	74.7	.43	63	2.00	2	937	80	85	827
Rushmore2 x Surpresa, FW114	12973	28.9	61.2	27	13.8	12.4	76.7	.49	62	1.25	2	897	85	85	868
Frontana x Thatcher, II-46-63	13046	31.5	58.9	33	15.8	14.7	72.2	.45	61	1.00	1	884	95	85	722
Red Egyptian x Frontana, II-45-7	13048	28.2	60.6	24	15.8	15.1	72.7	.51	66	1.50	2	877	80	85	697
Frontana x Thatcher, II-46-53	13099	30.7	58.5	35	15.4	15.0	72.4	.41	62	1.00	1	877	85	85	702
Henry x Cadet, Ns. 2239	12779	23.9	56.2	28	14.2	13.2	73.0	.48	63	2.00	2	876	75	90	796
Rushmore2 x Surpresa, Ns. 4042	13033	27.2	58.9	27	15.0	13.7	70.8	.45	64	1.50	2	876	95	90	767
Do., Ns. 4048	13039	29.0	59.8	28	14.7	13.7	72.2	.46	64	1.25	3	871	100	90	763
Mida x Kenya 117A, II-44-22	12964	27.0	60.1	35	15.2	14.1	65.7	.44	61	1.75	1	868	90	85	739
Selkirk, CT 186	13100	30.7	57.5	31	14.4	13.5	76.2	.47	63	2.25	2	864	85	90	768
Timstein x Henry, II-44-65	13026	26.8	57.2	32	14.0	13.3	71.4	.45	63	2.00	2	864	90	95	779
Rushmore2 x Surpresa, Ns. 4044	13035	27.3	58.9	28	14.9	13.3	68.7	.49	63	1.50	2	858	90	90	774
Henry x Cadet, Ns. 2300	12966	24.7	54.5	25	14.3	13.1	69.4	.46	64	1.75	2	856	80	90	784
Rushmore2 x Surpresa, Ns. 4045	13036	27.0	60.1	29	15.2	13.9	70.9	.47	64	1.50	2	850	85	90	734
Do., Ns. 4047	13038	27.5	59.3	29	15.4	14.2	72.6	.46	63	1.25	2	847	85	90	716
Frontana x Thatcher, II-46-52	13031	28.1	58.1	31	16.3	15.6	72.0	.42	62	1.00	1	847	85	85	651q
Rushmore2 x Surpresa, Ns. 4046	13037	28.3	59.3	27	15.0	14.5	72.4	.47	63	1.25	3	833	90	90	689
Do., Ns. 4043	13034	29.1	59.2	28	14.8	13.6	70.1	.46	64	1.00	2	831	90	90	733
Marquis	3641	17.2	52.8	23	13.1	12.5	67.6	.49	61	2.25	2	821	80	85	788
Pilot2 x Regent, Ns. 2183	13042	23.3	55.4	25	12.8	12.1	70.3	.42	63	2.00	2	813	75	75	806
Thatcher	10003	18.3	53.0	22	13.4	12.6	69.3	.48	62	2.50	1	803	70	80	765
Rushmore2 x Surpresa, FW36	12972	29.9	60.3	35	13.9	12.7	69.3	.46	62	.75	2	782	85	80	739
Kenya-Gular-Pilot x Kenya 58- Newthatch, II-46-56	13047	31.4	59.9	24	14.6	13.8	67.9	.61	64	1.25	2	773	80	75	672q
1520 x 1752, Ns. 2389	13041	18.6	53.7	23	13.0	12.0	71.8	.47	64	2.00	2	772	70	80	772
Average		26.7	58.0	28	14.6	13.6	71.1	.47	63	1.52	1.9	856	84	86	

1/ Dickinson, Moccasin, Havre, Minot, Madison, Langdon, Fargo, Brookings, Morris, and Crookston stations.

Supplementary Hard Red Spring Regional Yield Nursery

Forty-eight strains with Mida and Thatcher from the Supplementary Hard Red Spring Regional Yield Nursery were tested for milling, baking, and chemical properties. A composite of grain from seven stations was made as indicated in a footnote to Table 4.

The best varieties and strains for bread considering the data as a whole were Selkirk; Frontana x II-44-29, II-50-32, and II-50-25; Lee x Frontana, II-47-10; and Lee x Mida, Nos. 3880.15, 3880.95, 3880.138, and 3880.191. These milled satisfactorily producing a good yield of flour. The bread was of good quality. A number of other samples were equally as satisfactory in these respects but had short dough mixing times that are generally indicative of a short mixing tolerance. These samples were Frontana x II-44-29, II-50-19, and II-50-20; Frontana x Thatcher, II-47-37, II-46-13, and II-46-53; and Lee x Mida, 3880.5. The above enumerated samples made bread that scored high in either crumb color or grain or both.

Frontana x Thatcher, II-47-37, made the best bread of the samples tested due largely, it appears, to a very high protein content. It was highest in protein and flour yield, but had a shorter dough mixing time than the approved hard red spring varieties. Many of the Frontana strains had short dough mixing times but seemed otherwise to make reasonably good bread.

The Lee x Mida strains as a group appear to be medium in flour yield, high in water absorption, medium to long in dough mixing properties, and require a large amount of bromate for optimum bread. A number of the samples required 3 milligrams of bromate which is considerably above the average for the spring wheats this season. The pearling index indicates that the Lee x Mida strains were similar to the approved hard red spring wheats with respect to hardness of the grain. They show promise for the production of a satisfactory milling and bread baking wheat.

The Frontana x II-44-29 strains, considering the group as a whole, appear to have produced more wheats that were satisfactory in many of the milling and baking properties than the Frontana x II-44-22 strains.

Many of the strains derived from crosses with Frontana have shown promise as producing high yields of flour for their test weights. In a number of these wheats the ash content of the flour was low. The flour from many of them was soft to the touch and had high pearling index values (40 percent and higher), indicative of a soft type grain.

Table 4. Milling, baking, and chemical results on hard red spring wheats grown in the Supplementary Regional Yield Nursery, 1953 crop 1/

Variety or Cross	C.I. No.	Test Weight	Pearling Index Value	Protein		Flour		Absorp- tion	Mixing Time	Optimum Baking Method		Co.	Score	Co.	Leaf Volume Corrected to 12.0 Percent Protein	
				Wheat Flour		Yield Ash				Bromate Volume	Color Grain					
				Pct.	Pct.	Pct.	Pct.									
Frontana x Thatcher, II-46-13	13030	58.0	36	15.3	14.5	75.7	.46	64	1.00	2	934	95	95	934	95	773
Frontana x II-44-29, II-50-18		58.2	34	15.1	14.2	69.2	.44	61	1.50	2	930	90	95	930	90	786
Lee x Mida, 3880.14		55.0	26	14.3	13.3	71.2	.47	64	2.00	2	918	85	85	918	85	828
Frontana x II-44-29, II-50-17		59.3	38	15.3	14.4	73.0	.46	62	1.50	2	916	75	90	916	75	763
Do., II-50-19		58.2	39	15.1	14.2	73.5	.45	61	1.25	2	905	90	90	905	90	765
Do., II-50-35		58.6	37	14.7	13.7	70.8	.42	64	1.75	2	903	80	85	903	80	791
Selkirk, CT 186	13049	55.9	33	14.7	13.9	75.7	.44	62	1.75	2	903	95	90	903	95	779
Frontana x Thatcher, II-47-37		60.0	34	17.1	15.9	76.3	.43	60	1.25	2	902	95	100	902	95	680
Frontana x II-44-22, II-50-8		58.3	44	16.2	15.1	70.2	.49	61	1.50	1	887	70	85	887	70	705
Frontana x Thatcher, II-46-53	13044	58.2	40	15.6	14.5	73.9	.40	61	1.25	1	886	95	95	886	95	733
Lee x Mida, 3880.44		52.5	27	14.6	13.5	70.7	.47	64	1.75	2	874	80	85	874	80	777
Frontana x II-44-29, II-50-34		59.1	34	14.4	13.3	68.5	.42	62	2.00	2	873	75	90	873	75	788
Lee x Mida, 3880.186		53.8	27	14.7	13.5	71.4	.50	62	1.50	2	871	80	90	871	80	774
Frontana x II-44-29, II-50-20		59.2	39	15.0	14.2	70.8	.43	59	1.25	2	863	90	85	863	90	729
Do., II-50-32		60.1	40	14.8	13.4	74.9	.40	62	1.50	2	863	85	90	863	85	773
Timstein x Henry, II-44-65		52.3	32	14.4	13.4	71.0	.52	63	1.50	1	853	90	90	853	90	764
Lee x Mida, 3880.47		54.2	28	14.4	13.4	69.1	.47	64	1.50	2	853	85	85	853	85	764
Frontana x II-22-49, II-50-25		59.3	33	14.9	14.0	70.0	.46	61	1.25	2	852	85	85	852	85	730
Lee x Frontana, II-47-10		59.5	39	14.6	13.6	74.1	.44	61	1.50	2	852	95	85	852	95	752
Lee x Mida, 3880.15		54.1	26	14.6	13.6	70.8	.43	63	1.75	2	848	85	90	848	85	748
Frontana x II-44-29, II-50-24		58.5	41	15.5	14.3	74.5	.45	62	1.25	2	847	70	80	847	70	711
Lee x Mida, 3880.45		53.2	27	14.2	13.1	70.6	.46	65	1.50	2	847	85	85	847	85	776
Do., 3880.138		55.5	27	14.3	13.5	71.2	.47	63	1.75	2	845	80	90	845	80	751
Do., 3880.191		55.2	25	14.0	13.1	71.7	.47	62	1.50	3	845	85	95	845	85	774
Frontana x II-44-29, II-50-29		59.1	44	14.5	13.3	72.9	.43	59	1.25	2	844	85	85	844	85	761
Lee x Mida, 3880.5	12488	49.1	25	13.9	13.2	69.2	.49	63	1.75	2	843	75	90	843	75	766
Frontana x II-44-29, II-50-16		54.6	26	14.2	13.3	71.3	.47	64	1.25	2	843	85	90	843	85	761
Do., II-50-25		60.0	39	16.0	14.9	72.0	.43	60	1.50	2	840	85	85	840	85	676
Lee x Mida, 3880.68		60.0	43	15.0	14.1	73.9	.45	61	1.50	2	838	85	90	838	85	713
Do., 3880.146		53.5	27	14.7	13.9	71.6	.46	65	1.50	2	838	90	90	838	90	723
Do., 3880.128		54.0	25	14.2	13.2	71.7	.49	62	1.75	3	833	75	85	833	75	757
Lee x Mida, 3880.124	12488	53.0	26	14.8	13.9	70.7	.51	63	1.50	3	835	80	85	835	80	721
Frontana x II-44-22, II-50-1		49.6	25	14.1	13.3	72.0	.50	61	2.00	2	833	80	85	833	80	752
Do., II-50-7		55.1	26	14.0	13.1	70.5	.44	64	1.75	2	829	75	75	829	75	759
Do., II-50-13		58.7	37	15.9	14.5	69.5	.49	61	2.00	1	830	75	80	830	75	687
Lee x Mida, 3880.95		58.7	42	14.7	13.7	72.7	.46	61	1.50	1	820	85	85	820	85	718
Do., 3880.9		59.0	39	14.9	13.8	68.7	.45	63	1.25	2	818	80	80	818	80	747
Do., 3880.9		55.6	25	14.1	13.1	73.1	.47	64	1.75	2	815	90	90	815	90	747
Do., 3880.9		54.3	27	14.1	13.2	71.5	.44	63	1.75	1	813	85	80	813	85	739

Table 4. Continued

Variety or Cross	C.I. No.	Pearl- ing Test Weight Value	Protein		Flour		Absorp- tion	Mixing Time	Optimum Baking Method		Loaf Volume Corrected to 12.0 Percent Protein		
			Wheat	Flour	Yield	Ash			Bromate	Volume		Color	Grain
Frontana x II-44-29, II-50-23		58.7	37	14.6	13.3	69.6	.42	1.25	2	813	85	85	733
Rushmore ² x Surpresa, FW 36	12972	56.5	43	13.8	12.4	70.7	.46	.75	2	807	85	85	781
Frontana x II-44-22, II-50-3		59.7	42	15.5	14.7	73.7	.51	2.00	1	800	75	80	653u
Do. , II-50-14		60.0	44	15.2	14.3	70.1	.46	1.00	1	791	75	85	664
Frontana x II-44-29, II-50-21		60.2	39	15.1	14.0	74.1	.44	1.50	2	788	85	80	675
Mida	12008	46.6	22	12.2	11.4	69.3	.51	2.25	2	765	70	70	805
Frontana x II-44-22, II-50-15		61.6	38	15.2	14.2	72.7	.43	1.00	1	734	75	80	620u
Frontana x II-44-29, II-50-33		60.7	36	15.5	14.5	72.6	.45	1.50	2	732	75	75	606q
Lee x Frontana II-47-2		53.4	50	15.8	14.1	70.2	.48	1.25	1	692	70	65q	589q
Average		56.6	34	14.8	13.8	71.7	.46	1.52	1.9	843	83	86	
1/ Langdon, Minot, Fargo, Edgeley, Brookings, Morris, and Crookston Stations.													

1/ Langdon, Minot, Fargo, Edgeley, Brookings, Morris, and Crookston Stations.

State Nursery Trials

Results for the composite samples grown in nursery trials in Moccasin, Havre, and Sidney, Montana, are shown in Table 5.

The quality comparisons will be based on a consideration of the data as a whole. Some strains have exceeded others with respect to certain properties (flour yield, water absorption, and grain and texture of crumb) and will be briefly discussed.

In milling Lee x 1831, B-52-76, was poor. The flour yield was low and the middlings handled with difficulty, bolting or sieving slowly. This is a questionable strain because of its unsatisfactory milling characteristics. All of the other strains milled satisfactorily. The 1953 x Lee strains Nos. B-52-90, 91, and 92; along with 2236 x Lee, B-52-107; and Lee x 1831, B-52-73, were best of the samples in milling. Two of the Lee x 1831 samples, B-52-120 and 73, were highest of the group in flour yield. The yield of flour was 77.5 and 77.9 percent, respectively. These are promising wheats. The grain of strain 2105 x Lee, B-52-88, was softer than that of the others as shown by the relatively high pearling index, about 11.0 percent higher than Ceres. It may be softer than the milling trade would like.

There was about the same variation in the protein content among the samples as in previous years. The samples highest in wheat protein and best of the group in this respect were 2105 x Lee, B-52-88; 1898 x Lee, B-52-57; 2236 x Lee, B-52-107; 1953 x Lee, B-52-90; and Lee x 1831, B-52-63. All were 15.0 percent or higher in wheat protein content. A number of the strains tested as low as 13.4 to 13.9 percent in wheat protein content. Strain Lee x 1831, B-52-76, was one of these. It also milled poorly.

Most of the strains made relatively good bread. Strain 2236 x Lee, B-52-107, had a short dough mixing time which was less than either Thatcher or Ceres.

All except two produced loaf volumes that were about that expected considering the flour protein content. Lee x 1831, B-52-73, and 1953 x Lee, B-52-90, averaged about 10-percent lower in loaf volume than expected.

The best strains for bread considering the data as a whole were 2105 x Lee, B-52-84, and Lee x 1831, B-52-63. The crumb color of these was especially good. These are equal to, if not better than, the approved varieties. The next best were 1898 x Lee, B-52-57; 1953 x Lee, B-52-92; 2236 x Lee, B-52-107; and Thatcher.

Havre, Montana - Six varieties or strains from Havre, Montana, were included in these studies.

Both Thatcher and Rescue, included as standards, made good bread. Rescue made better bread than Thatcher, due probably to an exceptionally high protein content. The dough handling properties of Thatcher were, however, slightly better than those of Rescue.

Lee x Frontana was high in protein content and made good bread. It required higher amounts of oxidizing agent (potassium bromate) for optimum bread and was slightly shorter in dough mixing time than either Thatcher or Rescue. The dough handling properties of Lee x Frontana were slightly weaker than those of the approved varieties. It milled like a soft wheat and the flour was soft and velvety to the touch. The middlings were difficult to reduce to flour. The yield of flour (68.5 percent) was considerably lower than that expected from a wheat of 62.2 pounds in test weight. This is a questionable wheat because of its unsatisfactory milling characteristics.

Pilot² x Merit made good bread. It milled well with a high yield of flour and made bread high in loaf volume (slightly higher than expected for the flour protein content of the sample). The internal bread properties were good.

Strain 1520 x 1752 made the best bread. It milled well and made a loaf of high volume in relation to its protein content and had exceptionally good internal characteristics (crumb grain and color). It had about a 25-minute shorter dough mixing time than the approved varieties. It appears to be a promising strain for bread.

Strain 1750 x 1753 made good bread but was slightly lower in loaf volume than expected, according to the protein content of the flour. It had a shorter dough mixing time than either Thatcher or Rescue. It milled satisfactorily, producing a high yield of flour. The flour was granular to the touch. similar in this respect to the approved hard red spring varieties. Pilot² x Merit and 1520 x 1752 gave similar results.

Table 5. Milling, baking, and chemical results on hard red spring wheats grown in the Station nurseries, 1953 crop.

Variety or Cross	C.I. No.	Test Weight	Pearling Index	Protein				Absorp- tion	Mixing Time	Optimum Baking Method		Leaf Volume Corrected to 12.0 Percent Protein			
				Wheat Flour		Flour Yield	Ash			Bromate Volume	Crumb				
				Pot.	Pot.						Color		Grain		
Moccasin, Havre, Sidney, Montana (Composite)															
1898 x Lee, B-52-57	10003	60.6	30	15.1	14.2	75.1	.46	63	2.25	1	939	95	95	793	
2105 x Lee, B-52-88		60.5	39	15.1	14.8	76.1	.46	62	1.75	1	915	90	90	742	
Lee x 1831, B-52-69		60.0	34	14.1	13.9	75.2	.44	60	1.75	2	873	90	95	754	
Thatcher		59.0	29	14.2	12.9	74.8	.48	62	2.00	1	873	95	95	812	
Lee x 1831, B-52-124		61.0	27	14.5	13.5	75.7	.50	64	2.50	2	868	95	85	771	
2105 x Lee, B-52-84		62.0	30	13.9	13.2	74.8	.44	61	2.00	0	844	110	95	767	
Lee x 1831, B-52-63		61.9	34	15.1	14.1	75.2	.45	62	2.00	0	844	105	90	718	
Do., B-52-76		60.2	28	13.4	12.6	66.7	.46	63	1.75	1	843	95	85	803	
Do., B-52-120		61.4	31	14.1	13.4	77.5	.46	61	2.00	1	830	90	90	743	
Do., B-52-72		61.7	32	14.4	14.0	76.0	.46	62	1.75	1	815	95	90	699	
Do., B-52-119	60.5	32	13.8	13.0	76.2	.49	63	2.00	1	815	90	90	752		
2236 x Lee, B-52-107	6900	58.5	34	15.0	14.0	75.5	.46	64	1.50	1	813	95	95	697	
Lee x 1831, B-52-61		59.3	30	14.3	13.3	75.0	.45	60	2.25	0	810	95	85	731	
Ceres		60.9	28	14.0	13.4	74.5	.46	62	2.50	0	810	90	95	725	
1953 x Lee, B-52-92		59.8	34	13.6	12.8	75.9	.43	63	2.25	1	804	95	95	754	
Do., B-52-90		61.8	32	15.0	13.9	74.5	.45	64	1.75	0	800	85	85	691	
Do., 1352-94		60.0	33	13.5	12.9	75.7	.43	61	2.25	1	794	90	90	739	
Do., B-52-91		60.5	32	13.4	12.5	76.0	.43	61	2.25	1	773	90	90	742	
Lee x 1831, B-52-73		61.1	35	14.0	13.6	77.9	.47	64	1.75	0	770	80	85	679	
Average			60.6	32	14.2	13.5	75.2	.46	62	2.01	0.8	833	93	91	
Havre, Montana															
Rescue	12435	59.1	40	17.0	16.1	74.1	.47	62	2.00	1	985	90	90	734	
Lee x Frontana	12957	62.2	39	16.3	14.9	68.5	.40	61	1.75	2	892	80	90	718	
Pilot2 x Merit, N2164		61.3	21	14.4	13.3	73.0	.47	62	1.75	1	875	85	95	789	
1520 x 1752	13041	63.3	29	15.0	13.9	75.4	.44	61	1.50	1	863	95	95	745	
Thatcher	10003	61.2	28	15.1	14.6	73.1	.44	62	2.25	0	858	85	90	705	
1750 x 1753	12975	62.7	26	13.9	12.9	74.4	.43	59	1.50	1	768	80	85	714	
Average		61.6	31	15.3	14.3	73.1	.44	61	1.79	1.0	874	86	91		

Sawfly Resistant Trials

The results for a number of varieties and strains resistant to wheat stem sawfly grown in nursery and plot trials at Dutton, Sidney, and Havre, Montana, are shown in Table 6.

These trials include many strains of current interest. One of the principal interests in these tests is a comparison of the quality of the strains which include Rescue in their parentage with the quality of Thatcher and Rescue.

The best sample considering the data as a whole was Rescue x Thatcher-S615, B51-27. It made excellent bread and was satisfactory in milling and produced a good yield of flour. The dough handling properties were strong and elastic. This wheat is slightly better than Thatcher and superior to Rescue.

The wheats second in rank include 1764 x Rescue, B49-78; Rescue x Thatcher-S615, B51-39; Rescue x 1831, B51-9; 1750 x Rescue, B49-102; and 1764 x Rescue, B49-90. These wheats had satisfactory milling properties and produced a good yield of flour. The dough handling properties were strong and the grain and texture of the bread very good. Their loaf volumes generally were normal for the protein contents of the flours. These strains were about equal to Thatcher and slightly better than Rescue.

Those strains making fair to good bread but lacking the strength of Thatcher or Rescue were Rescue x Thatcher-S615, B51-37, B51-16, and B51-43; 1750 x Rescue, B50-120; and Chinook. These were satisfactory in milling, medium in water absorption, and their dough handling properties were good. The loaf volumes were lower (about 15 percent) than expected, but the crumb grain of the loaves very good. These samples were degraded principally because of their lower than expected loaf volumes.

Rescue x Thatcher, B50-18, ranking lowest of the wheats made satisfactory bread, but was deficient in milling. The middlings were tough and hard to reduce to flour. The yield of flour was good. This sample would rank higher had the milling properties been satisfactory.

Dutton and Havre, Montana, Nursery Composite - Strain N2157 x Rescue, Dick. 79, appears to be best of the six wheats in quality. although the difference is not very great between any of them. It milled satisfactorily, producing a high yield of flour and made bread of excellent grain. All the others made good bread. The dough mixing time of Rescue x Regent, 4337-24, was shorter than that of any of the other strains. The two Mida x Rescue strains, Dick. 89 and 93, produced exceptionally high flour yields (76.6 and 76.0 percent). The loaf volumes were about that expected according to their protein contents.

Moccasin, Havre, and Sidney, Montana, Advanced Plot Composite - Varieties and strains included in this composite comprise the more promising ones from the Montana spring wheat breeding program. Several are resistant to sawfly. All produced bread that was generally satisfactory in crumb grain and texture. There were more differences in crumb color among the samples than in some of the other bread properties. The loaf volumes of a number of the wheats were about that expected on the basis of their protein contents. The differences in quality between many of the strains were not very great.

The best of the sawfly samples considering the data as a whole were Rescue x Thatcher, B50-18; Rescue x Thatcher-S615, B51-16; 1764 x Rescue, B49-90; and Pilot² x Regent, N. 2183. These strains were slightly better than Thatcher or Rescue in quality.

Other strains that were strong in quality, similar to Thatcher, and better than Rescue were Rescue x Thatcher-S615, B51-27; 1520 x 1752, N. 2389; Rescue x 1831, B51-9; 1750 x Rescue, B50-120, and B49-102; 1764 x Rescue, B49-78; Pilot² x Thatcher, N. 2170; and 1764 x Henry. N. 2211.

The samples that produced a high yield of flour and are very promising in this respect were Rescue x 1831, B51-9; 1520 x 1752, N. 2389; and Rescue x Thatcher, B50-18.

Bozeman, Montana, Winter Wheats - Seventeen Yogo x Rescue sawfly-resistant winter strains grown at Bozeman, Montana, with Yogo, Newturk, and Karmont as checks were milled and bread baked from them. The results are shown in Table 6.

The kernel characteristics of the Yogo x Rescue strains were very similar in appearance to the spring wheats. As a group, they were found to be similar in hardness to the approved hard red spring varieties according to the pearling index. The flour was granular to the feel and the dough handling characteristics generally were strong and elastic.

The Yogo x Rescue strains milled satisfactorily and were similar in this respect to the milling properties of the three winter varieties included as standards. Yogo x Rescue, N. No. 50-7, was lowest of the group in flour yield and N. No. 56-19 was highest. A number of strains produced flour yields of 74.0 percent or higher. These wheat samples were smaller (only 2 pounds) than those usually milled; hence, the milling yields may be subject to greater errors than usual.

In general, all the wheats made satisfactory bread with the exception of crumb color.

Strains N. Nos. 76-24, 66-22, 45-30, and 47-18 were best for bread and equal to Yogo in this respect. The loaf volumes were generally high for the protein content of the flour and the internal bread properties very good.

N. Nos. 66-16, 56-19, 45-23, and 44-5 were the poorest. They were generally low in loaf volume, but were graded down principally because of poor crumb color. The other strains not included in these two groups made good bread, but were not quite as high in loaf volume or internal bread properties as those ranking highest. Karmont was included in this intermediate group.

Newturk was lowest in loaf volume of the samples and made bread of low to medium quality. All the Yogo x Rescue strains appeared to be stronger than Newturk for bread purposes.

Table 6. Milling, baking, and chemical results on sawfly resistant wheats grown in Montana, 1953 crop.

Variety or Cross	C.I. No.	Pearl- ing Test Index Weight Value	Protein			Flour Yield Ash	Absorp- tion	Mixing Time	Optimum Baking Method			Loaf Volume Corrected to 12.0 Percent Protein			
			Wheat Flour						Fromate	Crumb					
			Pot.	Pot.	Pot.					Volume	Color		Grain		
			Lb.	Pot.	Pot.	Pot.	Pot.	Min.	Mg.	Cc.	Score	Score	Cc.		
Dutton, Havre, Sidney, Montana, Nursery Composite															
1750 x Rescue, B49-102			59.6	33	14.2	13.5	74.2	.43	59	2.00	1	847	80	95	753
1764 x Rescue, B49-78			60.7	28	13.5	12.7	74.5	.40	61	2.25	0	835	85	95	789
Thatcher	10003		58.3	28	13.7	12.9	72.5	.41	61	2.25	1	833	85	90	775
1764 x Rescue, B49-90			58.7	26	14.4	13.9	72.0	.45	62	1.75	1	831	80	95	717
Rescue x 1831, B51-9			60.7	33	14.1	13.4	77.5	.43	60	2.50	1	828	80	95	741
Rescue x Thatcher-S615, B51-27			59.3	36	14.1	13.3	73.9	.38	61	1.75	1	818	80	100	738
Rescue	12435		59.5	33	13.8	13.1	74.7	.40	59	1.50	0	810	75	95	742
Rescue x Thatcher, B50-18			60.3	33	14.1	13.4	75.5	.40	60	2.50	1	810	90	90	725
Rescue x Thatcher-S615, B51-39			60.5	36	13.4	12.4	73.9	.35	61	2.00	1	782	80	95	757
Chinook, H4258			61.2	32	14.4	13.7	72.8	.37	60	2.25	1	762	85	90	567q
Rescue x Thatcher-S615, B51-43			60.8	32	13.8	13.3	73.7	.38	59	2.25	0	746	85	90	673q
1750 x Rescue, B50-120			60.1	32	14.2	13.0	74.4	.42	60	1.75	1	745	80	95	688q
Rescue x Thatcher-S615, B51-37			60.5	31	14.5	13.6	73.1	.39	62	2.50	1	740	80	95	553q
Do., B51-16			60.6	31	14.1	13.2	72.9	.41	61	2.50	0	718	80	85	553q
Average			60.0	32	14.0	13.2	74.0	.40	60	2.13	0.7	785	82	93	
Dutton and Havre, Montana, Nursery Composite															
2157 x Rescue, Dick. 81			60.5	36	15.0	14.1	74.9	.41	61	2.00	1	878	90	95	747
N2157 x Rescue, Dick. 79			59.8	37	15.0	14.1	75.9	.41	60	1.75	1	866	75	100	737
Rescue x Regent, 4337-24			59.8	38	14.3	13.4	73.7	.39	60	1.50	0	828	80	95	741
Mida x Rescue, Dick. 93			61.5	36	14.3	13.5	76.0	.39	59	2.25	1	824	80	95	732
Rescue x Regent, 4337-35			59.7	38	14.1	13.3	74.2	.39	59	2.00	0	810	80	95	731
Mida x Rescue, Dick. 89			61.0	37	14.2	13.3	76.6	.37	60	2.00	1	788	90	90	711
Average			60.4	37	14.5	13.6	75.2	.39	60	1.92	0.7	832	83	95	

Table 6. Continued

Variety or Cross	C.I. No.	Test Weight Value	Pearl- ing Index		Protein		Flour		Absorp- tion	Mixing Time	Optimum Baking Method		Leaf Volume		
			Lb.	Pct.	Pct.	Pct.	Yield	Ash			Bromate	Volume	Corrected to 12.0 Percent Protein		
													Crumb	Color	Grain
Moccasin, Havre, Sidney, Montana, Advanced Plot Composite															
Rescue x Thatcher, B50-18 1/		62.0	34	15.2	14.5	75.4	.40	61	2.00		1	930	85	90	770
Pilot	11945	59.2	27	14.4	13.3	72.5	.41	60	1.75		0	927	90	90	836
Rescue x Thatcher-S615, B51-27 1/		60.4	34	14.8	14.0	71.6	.40	61	2.00		1	913	85	90	782
Marquis 2/	3641	62.2	31	15.6	14.5	72.1	.41	62	2.00		0	897	75	90	742
1764 x Henry, N2211	12733	60.3	29	13.1	14.2	71.2	.39	61	2.00		2	897	80	90	758
Rescue 1/	12435	60.0	34	14.8	13.8	73.2	.42	59	1.50		1	887	75	95	771
1764 x Rescue, B49-90 1/		60.8	27	15.3	14.3	73.4	.48	62	2.00		2	881	85	95	739
Rescue x 1831, B51-9 1/		61.9	31	14.3	13.2	76.7	.42	60	2.00		1	880	80	95	800
1750 x Rescue, B49-102 1/		61.5	32	14.9	14.0	73.7	.43	59	1.50		1	870	85	90	746
Supreme 2/	8026	60.0	31	15.0	13.9	72.7	.42	62	2.25		2	861	95	95	615q
Pilot 2 x Regent, N2183	13042	60.0	29	14.4	13.2	72.7	.40	60	2.25		0	860	90	90	782
Ceres 2/	6900	62.0	26	15.7	14.6	72.5	.42	63	1.75		0	861	80	90	708
Rescue x Thatcher-S615, B51-16 3/		62.6	26	15.6	14.7	73.5	.45	61	1.50		0	858	85	95	700
Thatcher	10003	60.1	29	15.0	13.9	72.4	.41	61	2.00		0	855	80	90	738
1764 x Rescue, B49-78 1/		61.1	27	14.2	13.3	73.8	.44	61	1.75		1	853	75	85	770
1750 x Rescue, B50-120 1/		60.7	32	15.3	14.0	73.5	.43	62	1.75		1	849	80	95	728
Lee	12488	59.8	34	15.7	14.6	70.6	.45	61	2.00		0	840	80	85	690
Rescue x Thatcher-S615, B51-37 1/		61.6	31	14.7	14.5	72.4	.42	61	2.00		1	833	85	85	689
Pilot 2 x Thatcher, N2170	12947	60.3	34	14.5	13.2	72.1	.36	62	2.00		1	812	85	85	738
Chinook, H4258 1/		61.4	31	15.0	14.2	74.1	.39	61	2.00		1	810	80	80	684
Saunders, 3516	7008	59.1	27	14.0	12.9	74.9	.44	61	2.00		0	800	80	85	744
1520 x 1752, N2389	13041	62.2	27	14.1	13.4	75.6	.42	60	2.00		0	797	85	90	714
Rescue x Thatcher-S615, B51-39 1/		61.2	35	14.3	13.4	73.7	.37	60	2.00		0	794	75	75	711
Thatcher x Ceres, N1947		58.9	28	14.8	13.9	70.2	.44	61	2.00		0	787	65q	80	680
Rescue x Thatcher-S615, B51-43 1/		61.5	32	14.8	13.9	73.1	.41	63	2.25		0	775	85	85	669
1947 x 2044, N2413		60.0	29	13.6	12.9	71.3	.41	61	2.00		0	762	75	90	709
Average		60.8	30	14.7	13.9	73.0	.42	61	1.93		0.6	850	82	89	

1/ Sawfly wheats.

2/ Composite of Moccasin and Havre only.

3/ Composite of Moccasin and Havre - sawfly wheat.

Table 6. Continued

Variety or Cross	C.I. No.	Pearling Index	Test Weight	Protein				Absorp- tion	Optimum Baking Method			Loaf Volume Corrected to 12.0 Percent Protein	
				Wheat Flour		Flour Yield	Ash		Bromate Volume	Color	Grain		
				Pot.	Pot.								Min.
Bozeman, Montana													
Yogo x Rescue, 66-22		60.4	29	14.3	13.6	74.7	.42	61	2	838	70	85	739
Do., 47-18		58.0	30	14.6	13.7	71.0	.39	61	2	815	75	85	714
Do., 50-7		59.5	30	14.1	13.7	68.3	.42	59	2	807	75	85	707
Do., 56-28		57.2	32	14.4	14.0	73.8	.43	60	2	807	80	85	692
Do., 56-19		58.0	30	15.0	14.0	74.7	.46	60	1	804	65q	80	689
Do., 76-24		59.8	29	13.3	12.8	72.6	.41	61	2	804	75	90	754
Do., 58-4		58.1	34	14.1	13.4	74.6	.42	60	2	800	70	85	716
Do., 45-30		59.2	29	14.0	13.4	75.3	.42	59	2	794	80	85	711
Do., 63-4		59.4	31	14.1	13.6	74.0	.42	60	2	791	80	85	698
Do., 77-11		58.4	28	13.9	13.4	72.4	.43	61	2	791	65q	90	708
Do., 56-9		58.5	32	14.5	13.8	77.0	.42	59	2	785	75	80	683
Do., 66-16		58.3	29	13.2	12.9	74.2	.42	61	2	779	65q	85	725
Do., 58-3		58.8	31	13.2	12.6	74.2	.40	60	2	769	70	85	732
Do., 44-16		58.9	29	14.1	13.3	75.0	.45	59	2	759	70	80	685
Yogo	8033	59.2	27	12.6	12.0	74.5	.43	62	2	750	75	85	750
Yogo x Rescue, 45-23		58.6	30	13.9	12.8	75.3	.43	62	2	744	70	75	697
Do., 47-10		57.3	30	13.6	12.7	71.2	.44	60	1	743	65q	75	702
Karmont	6700	58.4	29	14.3	13.0	73.8	.41	61	2	737	80	80	680
Yogo x Rescue, 44-5		58.9	27	13.1	12.3	75.1	.45	59	2	726	65	80	708
Newturk	6935	59.4	28	13.2	12.1	73.0	.44	60	1	680	70	70	674q
Average		58.7	30	13.9	13.2	73.7	.43	60	2.2	776	72	83	

Special Foreign Varieties and Strains

Choteau, Montana - Results for 19 (Group I) and 26 (Group II) varieties and strains, originally from Portugal but grown at Choteau, Montana, are shown in Table 7. They are of interest because of their possible use as parents in crosses to obtain resistance to wheat stem sawfly. Thatcher and Rescue were included in both groups for comparison. The varieties and strains are discussed largely on a consideration of the quality data as a whole with additional remarks about some of the individual properties of the wheats.

The varieties in Group I generally averaged lower in loaf volume than expected considering the protein contents of the flours. Also, a number of them produced bread having poor crumb color. The crumb grain of the bread was particularly satisfactory for many of them. Many were rated as questionable or unsatisfactory with respect to loaf volume. The milling quality was satisfactory for all except five which will be mentioned later.

Amarello de barba preta x Ribeiro, Nos. 56219-12 and 56220-3, and Santa Martha x Fuscense, 56229-2, were best of the group considering all quality characteristics. Their milling properties and internal bread characteristics were satisfactory; the doughs were strong and elastic and the ash contents of the flours were relatively low. These three strains were equal in quality to Rescue and better than Thatcher in some properties.

Those strains that ranked second making good bread and nearly equal to Thatcher in quality were Amarello de barba preta x Ribeiro, Nos. 56219-5, 6, 8, and 10. These strains milled satisfactorily, producing relatively high yields of flour. The doughs generally were of good strength, but slightly sticky and the bread acceptable in crumb color and grain. All were somewhat lower in loaf volume than expected for their flour protein contents. Samples Nos. 56219-6, 8, and 10 were the poorest in this respect.

Amarello de barba preta x Ribeiro, Nos. 56220-2, 8, and 9, made bread that was deficient in loaf volume and crumb color, but excellent in bread grain and texture. The milling properties were very good and the flour was low in ash content and high in protein content. These three samples were rated as fair, principally because of their good milling properties and their satisfactory bread grain and texture characteristics. Amarello de barba branca x Ribeiro, 56218-2, was another strain generally making fair bread. It was deficient in loaf volume, but fair in crumb color and grain. It milled satisfactorily and produced a high yield of relatively low ash flour. These wheats are not as strong as either Thatcher or Rescue but have some favorable properties as mentioned.

Beirao made unsatisfactory bread. It was deficient in milling and produced a low yield of flour. It milled like a soft wheat except that the middlings were tough and difficult to reduce to flour. The four Ribeiro samples, Nos. 56206-1, 4, and 5, which are classed durum, made extremely poor bread that were deficient in loaf volume and internal characteristics. The flour was excessively high in ash content and the dough sticky and weak. The water absorption of the flour was high. The milling properties were poor, middlings being tough and hard to reduce to flour and the yield of flour lower than expected in relation to test weight.

Two of these samples showed a slightly higher protein content in the flour than in the wheat. A number of the wheat samples in this study were smaller in size than normally milled which may account, in part, for the abnormal relationship.

A number of the varieties and strains in Group II made very acceptable bread with some much better than others. The bread from some was low in crumb color and deficient in loaf volume. Some would have rated higher had their loaf volumes been better and about that expected for their protein contents. A great many samples produced a high yield of flour which was better than expected considering the test weight of the grain.

Sukehai pissi; P.I. 7315; S-618; and Santa Martha x Fuscense, 56229-1, made excellent bread. These samples milled satisfactorily. produced a high yield of flour, and their doughs were strong and elastic. The bread characteristics (loaf volume, crumb color, and grain) were particularly good. These are strong wheats equal to, if not slightly better than, Thatcher and Rescue for bread. Strain S-615 was deficient in loaf volume, but otherwise made bread of excellent characteristics.

Those making very good bread and generally similar to Thatcher and Rescue were Pusa 106, 5449-2, 3, and 5; Amarello de barba branca x Ribeiro, 56218-1; and Amarello de barba preta x Ribeiro, 56219-9. These milled well and produced a high yield of flour. The doughs were elastic and pliable and the water absorption of the flour medium high. The crumb grain of the bread was good and slightly better in most cases than the crumb color. The dough mixing times were relatively long for samples 5449-3 and 5. These are medium-strong bread wheats.

Amarello de barba preta x Ribeiro, 56219-11, made good bread but the loaf volume was lower than expected, based on the flour protein content. Doughs were strong and the flour yield high. The crumb color was low but satisfactory and the crumb grain of the bread very good.

Amarello de barba preta x Ribeiro, 7027, 56219-2, and 56219-4, and Barbella x Santa Martha, 56222-6, made only fair bread. These were deficient in loaf volume and low to medium in internal bread characteristics. The dough handling properties for all of these were relatively strong. These are poorer bread wheats than either Thatcher or Rescue.

Unsatisfactory bread was made from No. 2738; Beirao; Amarello de barba preta x Ribeiro, 56220-6, 7, and 11; Barbella x Santa Martha, 56222-12, Lobeiro x Barbella, 56225-3; No. 56225-3; No. 56225-11-30A; and No. 56225-11-30B. These samples were not all poor in crumb grain of bread, but deficient in loaf volume and poor in crumb color. Some of the loaf volumes were nearly 35 percent lower than expected considering the flour protein contents. The milling properties were satisfactory and the yields of flour relatively high.

Table 7. Milling, baking, and chemical results on special foreign varieties and strains, 1953 crop.

Variety or Cross	C.I. or P.I. No.	Test Weight	Protein		Flour		Absorp- tion	Mixing Time	Optimum Baking Method			Co.	Score	Co.	Leaf Volume Corrected to 12.0 Percent Protein
			Wheat Flour	Yield	Ash	Bromate Volume			Color	Grain					
											Pct.				
Choteau, Montana (Group I)															
Thatcher	10003	58.8	14.9	14.3	67.7	.37	62	2.00	1	868	70	90			728
Rescue	12435	60.4	14.5	13.8	73.2	.34	59	1.50	1	860	85	95			748
Amarello de barba preta x Ribeiro	56219-5	60.7	14.6	14.1	75.4	.48	60	1.50	1	800	70	85			681
Do.	56220-3	61.4	14.5	13.7	75.5	.45	59	1.50	1	758	80	95			664
Do.	56219-12	60.5	14.6	13.9	76.3	.46	59	1.00	1	744	75	90			642q
Do.	56220-2	60.0	15.4	14.6	73.3	.39	58	1.00	1	726	65q	95			597q
Beirao	56202-9	60.5	15.6	14.5	70.6	.43	55	1.00	1	724	60q	65q			599u
Santa Martha x Fuscense	56229-2	60.9	14.4	13.7	75.8	.40	59	1.75	1	718	85	90			629q
Amarello de barba preta x Ribeiro	56219-6	61.9	14.3	13.7	75.1	.44	59	1.00	1	716	80	90			627q
Amarello de barba branca x Ribeiro	56218-2	62.4	14.2	13.7	76.3	.44	61	1.00	1	709	65q	70			621q
Amarello de barba preta x Ribeiro	56219-8	62.4	14.3	13.3	74.3	.36	58	1.00	1	692	85	90			624q
Do.	56219-10	61.9	13.5	12.7	73.8	.43	58	1.25	1	692	70	85			654q
Do.	56220-8	60.7	14.9	14.1	73.7	.38	61	1.00	1	691	60q	95			588u
Do.	56220-9	60.2	15.4	14.8	74.3	.42	60	1.00	1	672	65	95			545u
Ribeiro	56206-1	60.4	17.0	16.8	68.4	.80	63	1.75	0	614	40u	40u			438u
Do.	56206-4	60.0	17.0	17.2	70.2	.89	68	1.50	0	559	35u	40u			390u
Do.	56206-5	59.2	17.3	17.2	71.6	.88	68	1.50	0	530	35u	40u			370u
Do.	56206-2	60.0	16.7	17.0	71.6	.82	66	1.50	0	546	35u	35u			365u
Average		60.6	15.2	14.6	73.2	.51	61	1.31	.78	701	64	77			

Table 7. Continued

Variety or Cross	C.I. or P.I. No.	Test Weight	Protein		Flour Yield Ash	Absorp- tion	Mixing Time	Optimum Baking Method			Co.		
			Wheat Flour	Pet.				Pet.	Bromate Volume	Crumb			
										Color		Grain	
Choteau, Montana (Group II)													
(No name)	7315	62.2	15.3	15.0	75.8	.43	61	2.00	1	991	95	100	793
Suknai pissi	4558	62.2	15.4	15.0	73.6	.41	57	1.50	1	905	85	100	724
Fusa 106	5449-5	61.6	14.5	14.3	75.0	.43	59	2.25	1	870	85	95	730
Do.	5449-2	61.5	14.8	14.5	72.5	.43	58	1.75	1	863	80	85	714
Do.	5449-3	62.2	14.6	13.9	75.4	.40	59	2.25	1	853	70	90	740
S618	12159	60.7	14.5	13.5	74.7	.44	59	1.75	1	845	85	100	751
S615	12157	61.0	16.2	15.9	74.3	.44	60	1.25	1	839	95	100	633q
Amarello de barba branca x Ribeiro	56218-1	61.4	15.2	14.7	74.9	.54	63	2.25	1	823	90	90	672
Amarello de barba preta x Ribeiro	56219-9	61.6	14.9	14.4	75.0	.55	62	2.00	1	781	90	95	651
Santa Martha x Fuscense	56229-1	62.1	14.4	13.6	76.9	.44	63	1.50	1	779	90	95	687
Thatcher	10003	60.7	14.0	13.5	75.2	.37	60	2.00	1	773	75	95	687
Rescue	12435	61.1	13.5	12.8	75.3	.39	59	1.50	1	768	80	95	720
Amarello de barba preta x Ribeiro	56219-11	62.1	14.7	14.0	76.2	.54	61	1.50	1	732	70	95	627q
Do.	56220-7	61.2	16.3	15.8	74.6	.50	62	1.00	1	718	60q	80	545u
Do.	7027	61.2	15.4	14.6	74.9	.52	62	1.25	1	715	60q	80	586u
Do.	56220-6	61.4	17.7	17.1	74.3	.50	62	1.00	1	703	65q	80	493u
Do. 2738	134871	61.9	15.3	14.2	71.5	.42	58	1.25	1	702	55u	65q	593u
Amarello de barba preta x Ribeiro	56220-11	61.6	15.5	15.0	76.1	.49	60	1.00	1	684	60q	80	547u
Barbella x Santa Martha	56222-6	60.9	14.4	13.6	70.2	.53	60	1.50	1	680	70	80	600u
Lobeiro x Barbella	56225-3	57.7	16.3	16.0	75.1	.46	59	1.00	1	665	55u	60q	499u
Barbella x Santa Martha	56222-12	59.7	14.8	14.3	74.5	.54	64	1.00	1	662	65u	70	555u
(No name)	56225-11-30A	62.2	13.5	12.6	76.0	.48	61	1.25	1	662	65q	70	630q
Amarello de barba preta x Ribeiro	56219-4	62.6	13.8	12.9	74.8	.56	60	1.00	1	651	65q	75	606u
(No name)	56225-11-30B	55.9	16.7	16.0	75.3	.51	60	1.00	1	649	50u	55u	487u
Amarello de barba preta x Ribeiro	56219-2	63.1	14.0	13.2	75.7	.50	60	1.25	1	631	70	75	574u
Beirao	56202-3	60.1	16.9	15.7	69.9	.52	53	1.25	1	605	55u	55u	462u
Average		61.2	15.1	14.5	74.5	.47	60	1.47	1.00	752	73	83	

Mexican Varieties and Strains in Nursery Trials

Twenty-two of the better varieties and strains from the Mexican breeding program with Lee and Mida as checks were milled and bread baked from them. These were grown at Madison, Wisconsin; St. Paul, Minnesota; Langdon and Fargo, North Dakota; and Brookings, South Dakota. The results for the five-station composite are shown in Table 8.

As a group these varieties and strains were medium to high in protein and generally lower in test weight per bushel than usual for spring wheats. They required medium to high amounts of potassium bromate for optimum bread results. There was considerable variation in the baking properties, some making excellent and others very poor bread. A great many of the wheats milled poorly.

The best strains for bread considering the data as a whole were Kentana-Yaqui, 2589; Yaqui 50; and Yaqui (Timstein-Kenya), 2245. They milled satisfactorily producing a good yield of flour and their dough handling properties were strong, pliable, and elastic.

The wheats that ranked second in quality and nearly as good as the strains enumerated above were Mayo 52; Yaqui-Kentana, 2254-2c; Timstein x Kenya², 775; General Urquiza, 1122; Taboada 5; Lee; and Mida. These strains have relatively low pearling index values (22.0 to 28.0 percent) and generally have produced a granular type flour to the feel. The crumb color and/or crumb grain of the bread from these samples were not quite as good as that in the bread from those rated as highest in quality. The loaf volume was slightly low for Timstein x Kenya², 775. The wheat of General Urquiza, 1122, and Taboada 5 was softer than Lee, Mida, or Yaqui and the flour semisoft to the feel. Taboada 5 and General Urquiza, 1122, may be softer than desired by the milling trade.

Mayo 52 and Yaqui-Kentana, 2254-2c, were highest of the group in yield of flour; 75.6 and 74.2 percent, respectively.

A number of other strains made fairly good bread, but were deficient principally in milling properties. These were Timstein x Kenya (Blanco); Kentana 51B; Kentana x Yaqui, 2587; (Egypt-Timstein) Mayo, 2156; and Maria Escobar²-Newthatch, 1930-17c-3T-1H; and (Kenya-Marroqui) Maria Escobar², 1442. In these the middlings generally were difficult to reduce to flour and the flour was soft and bolted or sieved slowly. In some samples the bran was found difficult to clean free of flour. This, no doubt, reduced the yield of flour obtained from a number of wheats. These were generally lower than the yield of flour from either Lee or Mida. The pearling index values were high, 35 to 44 percent, indicative of a softer grain than the approved hard red spring varieties. The dough handling properties of most of these generally were satisfactory except for Maria Escobar²-Newthatch, 1930-17c-3T-1H, which was slightly sticky and not very elastic. This strain also had a very short dough mixing time which may possibly be an objectional property to the commercial baker. Maria Escobar²-Newthatch, 1930-17c-2T-9H, had a short dough mixing time and made fairly good bread, but was deficient in dough handling properties. The milling quality of this strain was satisfactory. Timstein x Kenya (Cafe) made fairly good bread,

but was slightly low in loaf volume and deficient in milling and dough handling properties. It had the softest grain of any of the wheats and the flour from it was very soft and velvety to the feel.

Yaqui-Kentana, 2254-lc. made good bread. but was deficient in dough handling properties and milling. Kentana-Yaqui (May segregate), 2585, made bread that was only fair in quality. but was satisfactory in milling and dough handling properties.

The four varieties and strains. Lerma 52; Egypt 101 x Timstein; (Newthatch-Marroqui)(Mentana-Kenya), 908; and (Aguilera-Kenya)(Marroqui-Supremo), 1088; were of poor quality. They made bread of poor characteristics and were unsatisfactory in dough handling and milling properties.

This was an interesting group of wheats with respect to the use and response of potassium bromate in the baking formula. The unbromated loaves generally were low in volume and the internal characteristics very poor. They were considerably improved in bread quality with bromate. It appears that this may possibly be a characteristic of most of these foreign strains and varieties. Many of the foreign wheats required much more bromate than either Lee or Mida.

Table 8. Yield, milling, baking, and chemical results for the Mexican wheats grown in nursery trials, 1953 crop. 1/

Variety or Cross	Acre Yield	Test Weight	Pearl- ing Index	Protein				Flour				Absorp- tion	Mixing Time	Optimum Baking Method			Leaf Volume Corrected to 12.0 Percent Protein
				Wheat		Flour		Yield		Ash				Bromate	Volume	Color	
				Bu.	Lb.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.					Mg.	Cc.
Taboada No. 5	25.4	53.7	35	14.9	13.8	73.4	.47	60	2.25	1	922	80	90			802	
Yaqui(Timstein-Kenya), 2245	19.6	54.8	26	13.5	14.1	71.1	.49	64	2.00	2	917	100	95			780	
(Egypt-Timstein)Mayo, 2156	22.1	52.5	43	14.7	13.3	68.8	.50	61	2.00	2	884	90	95			798	
Mayo 52	28.2	55.2	28	14.4	13.3	75.6	.56	62	2.25	2	868	85	90			783	
Yaqui-Kentana, 2254-2c	26.1	54.5	23	13.9	12.7	74.2	.52	62	1.75	2	864	85	95			816	
General Urquiza, 1122	22.7	58.8	34	14.8	13.2	70.8	.45	61	1.50	2	863	75	90			784	
Kentana x Yaqui, 2589	26.1	56.3	27	14.5	13.4	73.3	.47	61	1.50	2	835	95	90			748	
Yaqui 50	19.8	53.5	24	14.5	12.9	71.7	.51	64	2.25	1	831	90	90			773	
Kentana x Yaqui, 2587	28.6	54.5	36	14.7	13.0	70.8	.49	61	2.25	1	800	80	85			738	
Timstein x Kenya (Cafe)	27.4	54.5	48	15.9	14.4	68.9	.51	59	1.25	3	785	90	85			654q	
Timstein x Kenya (Blanco)	28.7	56.1	44	15.1	13.5	71.4	.50	60	2.00	2	771	80	85			685	
(Kenya-Marroqui2)Maria Escobar, 1442	28.4	57.6	36	14.3	12.6	70.8	.49	64	1.50	1	754	80	80			718	
Lee (Check)	24.0	54.3	26	14.5	13.5	71.8	.48	61	2.00	0	751	80	80			667	
Kentana 51B	31.0	59.0	40	14.7	13.0	69.7	.47	58	1.50	2	748	95	95			690	
Yaqui-Kentana, 2254-1c	22.6	55.8	35	14.2	12.1	67.7	.52	61	1.75	2	737	75	80			731	
Maria Escobar2-Newthatch, 1930-17c-2T-9H	31.0	60.9	35	14.2	12.4	70.0	.45	58	1.00	1	734	85	85			710	
Timstein-Kenya2, 775	29.1	54.4	28	14.9	13.7	73.4	.45	63	1.75	2	723	85	90			633q	
Maria Escobar2-Newthatch, 1930-17c-3T-1H	26.9	59.1	37	14.0	12.4	71.7	.47	54	1.00	2	722	90	85			659	
Egypt 101 x Timstein	22.3	53.4	41	15.6	14.1	71.3	.54	59	1.50	1	719	65q	55u			612q	
Mida (Check)	16.7	52.6	23	12.6	11.6	71.3	.49	59	2.00	1	715	70	85			740	
(Aguilera-Kenya) (Marroqui-Supremo), 1088	27.5	56.1	44	14.7	13.0	69.5	.48	58	1.25	2	714	60q	65q			659q	
Kentana x Yaqui(May segregate), 2585	27.0	57.1	26	13.4	12.3	73.0	.48	60	1.50	2	685	75	70			668	
(Newthatch-Marroqui)(Kentana-Kenya), 908	25.8	53.3	39	14.6	12.7	71.6	.48	58	1.25	0	684	50u	40u			646q	
Lerma 52	31.6	56.1	44	14.1	12.5	69.0	.48	58	1.25	1	669	70	60q			642q	
Average	25.8	55.5	34	14.4	13.1	71.3	.49	60	1.68	1.5	779	80	82				

1/ Composite of seed from Madison, Langdon, Fargo, St. Paul, and Brookings Stations.

Commercial Samples

As in past years, a number of commercially grown wheat samples were obtained through the Grain Division, Agricultural Marketing Service, for comparison with the varieties and strains produced in experimental plots. Fourteen such samples, representing a number of grades and types, were obtained at Great Falls, Montana, and Minneapolis and Duluth, Minnesota. The samples were composited by grade from 4,299 cars of wheat grading No. 3 or better. This is the fifteenth season such samples have been tested. The results are given in Table 9.

These samples generally averaged lower in protein content than the varieties and strains grown in experimental plot and nursery trials. The Great Falls, Montana, samples averaged highest in protein content and Minneapolis, Minnesota, samples lowest. The milling characteristics were much alike for the commercial and experimental samples with the experimental varieties and strains slightly higher in yield of flour. Otherwise, the baking and chemical results do not appear to be greatly different when compared with samples having approximately the same protein content.

Table 9. Milling, baking, and chemical results on 14 composite commercial samples of hard red spring wheat obtained at Great Falls, Mont., Duluth and Minneapolis, Minn., representing the 1953 crop.

Location Where Obtained	U.S. Grade	No. of Cars	Pearl- ing Test Index	Protein				Absorp- tion	Optimum Baking Method			Loaf Volume Corrected to 12.0 Percent Protein			
				Wheat Flour		Flour			Time	Bromate Volume	Crumb				
				Lb.	Pct.	Pct.	Pct.				Mg.		Score	Color	Grain
Minneapolis, Minnesota															
Do.	1 HDNS	197	61.0	28.7	13.0	12.4	73.6	.43	62	2.00	1	751	80	75	727
Do.	1 DNS	204	59.5	29.3	13.1	12.4	72.6	.43	64	2.00	1	776	85	80	751
Do.	2 DNS	180	57.8	25.7	12.1	11.6	73.0	.44	63	2.00	1	726	80	80	751
Do.	3 DNS	228	56.3	24.9	12.1	11.4	68.4	.44	62	2.00	1	702	75	75	739
Do.	1 HNS	485	60.1	30.7	12.3	11.5	76.3	.44	63	2.00	1	722	80	80	753
Average															
			58.9	27.8	12.5	11.8	72.8	.44	63	2.00	1.0	735	80	78	747
Duluth, Minnesota															
Do.	1 HDNS	410	61.0	29.2	13.4	12.5	73.4	.41	63	2.00	1	770	80	85	739
Do.	1 DNS	508	59.4	27.3	13.4	12.5	73.1	.44	61	2.00	1	750	75	90	720
Do.	1 DNS	304	58.8	27.2	12.9	12.1	72.0	.42	61	1.50	1	745	75	85	739
Do.	3 DNS	255	56.8	24.3	12.7	12.0	70.0	.43	60	2.00	2	737	80	80	737
Do.	1 NS	90	59.3	29.3	12.3	11.9	74.1	.42	61	2.00	1	726	85	85	732
Do.	2 NS	109	58.1	28.9	12.2	11.8	72.6	.42	60	2.00	1	709	85	80	721
Average															
			58.9	27.7	12.8	12.1	72.5	.42	61	1.92	1.2	739	80	84	733
Great Falls, Montana															
Do.	1 HDNS	1138	61.7	31.1	13.6	12.7	73.6	.42	60	1.50	1	739	80	90	698
Do.	1 DNS	60	60.0	30.3	14.6	13.6	71.6	.42	62	2.00	1	827	80	75	730
Do.	2 DNS	131	61.6	29.7	13.9	12.7	72.8	.40	60	2.00	1	784	95	90	741
Average															
			61.1	30.4	14.0	13.0	72.7	.41	61	1.83	1.0	783	85	85	

Total Cars 4299

Strains and Varieties of Current Interest

Each year many new wheats are tested along with the leading commercial varieties for chemical composition, milling, and bread baking quality. The data on two hybrid strains and two varieties with averages expressed as a percentage of comparable samples of Lee are shown in Table 10.

Willet

Willet is Frontana x Thatcher II-46-53. Minn. 2855. C.I. 13099. and was developed at St. Paul, Minnesota. It has good 15B stem rust resistance.

Comparable milling and baking tests show that Willet has exceeded Lee with respect to protein content of wheat and flour, test weight per bushel and loaf volume, and grain of bread. It averaged lower than Lee in ash content of flour, water absorption, and yield of flour. Willet has a short dough mixing time, averaging about 50 percent less than that of Lee. The dough handling properties of Willet were weak and sticky. It has shown fair to good milling properties. The grain is somewhat softer (according to the pearling index values) than Lee. The flour is semihard to the feel.

Ns. 3880

Ns. 3880 is Lee x Mida sib, C.I. 12976. It was developed at and first included in trials in North Dakota.

The weighted average of four comparable samples shows that Ns. 3880 has exceeded Lee in many of the characteristics for which comparisons have been made. It milled satisfactorily, but produced less flour than Lee on the basis of their test weights. The dough handling properties were strong, being pliable and elastic. This is a promising bread wheat.

Frontana x Thatcher, II-46-13

Frontana x Thatcher, II-46-13. Minn. 2854. C.I. 13030, was developed at St. Paul, Minnesota, and has shown good 15B stem rust resistance.

Comparable milling and baking tests of four samples show that Minn. 2854 exceeds Lee with respect to test weight per bushel, protein content of wheat, and flour and crumb color of bread. It has been one of the better samples in wheat protein content, averaging 1.0 percent higher than Lee. Although high in protein content the loaf volume is lower than expected, indicating that the quality of the gluten is not as strong as some of the approved varieties. The dough mixing time for Minn. 2854 is shorter (about 55 percent) and more critical than for Lee. It produced a dough that was sticky and weak.

This year's samples milled satisfactorily, but the flour was soft to the feel and unlike that from the approved hard red spring varieties. It averaged lower in flour yield than expected for the test weight per bushel of the samples and of the comparably grown samples of Lee.

Kentana

Kentana, a Mexican variety with good 15B stem rust resistance, was grown for the first time in plots at three Minnesota stations.

The weighted average of comparably grown samples shows that Kentana was inferior to Lee in a number of important characteristics. It exceeded Lee, however, in test weight per bushel, crumb color and grain of bread, and was lower than Lee in flour ash. It has a considerably shorter (40 percent) dough mixing time than Lee and weak dough characteristics. The milling characteristics of Kentana were poor. It milled like a soft wheat and the middlings were difficult to reduce. The flour bolted slowly. This wheat is inferior to the approved varieties in dough handling and milling properties.

Selkirk

Selkirk, CT 186, is a Canadian variety developed from a McMurachy-Exchange x Redman cross. It has shown resistance to 15B stem rust at low temperatures. It has been approved for distribution in Canada.

Comparable milling and baking tests of thirteen samples show that Selkirk is very similar to Lee for many of the characteristics for which comparisons have been made. It has produced a slightly higher yield of flour than Lee. It milled satisfactorily and made a granular flour similar to the approved varieties in this respect. The dough properties of Selkirk were good, being elastic and pliable. Selkirk required about the same amount of potassium bromate as Lee for optimum bread results. It made satisfactory bread slightly exceeding Lee in bread loaf volume, crumb color, and grain. This is a good bread wheat and has many of the favorable properties found in the approved varieties.

Table 10. Comparison of the yield per acre, test weight per bushel, milling, baking, and chemical properties of four varieties of wheat with the variety Lee, 1953 crop.

Variety or Cross	No. of Samples	Acres Yield	Pearling		Optimum Baking Method									
			Test Weight	Index Value	Protein		Flour		Absorp- tion	Mixing		Crumb		
					Wheat	Flour	Yield	Ash		Time	Bromate	Volume	Color	Grain
		Bu.	Lb.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Min.	Mg.	Cc.	Score	Score
Willet Lee	4	29.3	58.9	38	14.5	13.5	73.1	44	61	1.19	1.5	819	85	89
	4	26.4	58.0	28	13.0	12.2	74.4	49	63	2.20	1.3	768	88	85
Percentage of Lee		110.9	101.6	135.7	111.5	110.7	98.2	89.7	96.8	54.0	115.3	106.6	96.5	104.7
Selkirk Lee	13	30.4	58.7	30	13.5	12.9	76.1	46	62	2.02	1.3	808	85	88
	13	25.7	58.4	29	13.9	13.1	73.9	47	63	2.08	1.2	775	82	86
Percentage of Lee		118.2	100.5	103.4	97.1	98.5	102.9	97.9	98.4	97.1	108.3	104.3	103.7	102.3
Lee x Mida sib., Ns. 3880	4	25.5	59.4	26	13.9	13.0	72.2	43	61	2.00	1.8	796	84	90
	4	23.4	57.5	26	13.4	12.7	72.2	44	60	2.06	1.5	765	79	88
Percentage of Lee		108.9	103.3	100.0	103.7	102.3	100.0	97.7	101.6	97.0	120.0	104.0	106.3	102.2
Frontana x Thatcher, Minn. 2854	4	30.5	59.2	38	14.0	12.9	73.8	46	61	1.00	1.5	779	86	88
	4	26.4	58.0	28	13.0	12.2	74.4	49	63	2.20	1.3	768	88	85
Percentage of Lee		115.5	102.0	135.7	107.6	105.7	99.1	93.8	96.8	45.4	115.3	101.4	97.7	103.5
Kentana Lee	3	28.0	58.7	47	13.1	11.5	71.3	45	60	1.25	1.7	732	95	88
	3	27.3	57.1	29	13.4	12.5	73.6	48	62	2.08	.7	787	88	85
Percentage of Lee		102.5	102.8	162.0	97.7	92.0	96.8	93.7	96.7	60.0	242.8	93.0	107.9	103.5

